# U.S. Army Garrison Alaska

# 2007-2011 Integrated Natural Resources Management Plan

# VOLUME III, Supplements

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# VOLUME III, SUPPLEMENTS

# SA. ECOSYSTEM MANAGEMENT

The goal of the ecosystem management program is to maintain ecosystem function and species diversity at a landscape scale, and to provide an environment where Soldiers can train to a high level of military readiness. All types of land use, by humans and wild species, are considered components of ecosystems, and the program seeks to avoid land use conflicts by proactive planning. Adjacent land owners and other stakeholder interests are sought for inclusion in the program with the understanding that local management decisions can affect the larger landscapes encompassing Army lands in Alaska.

## SA1. Introduction

An ecosystem approach to the management of military training lands has been clearly stated and endorsed by the Department of Defense (1996). Because it is extremely difficult to obtain additional military training land, it is imperative that the military maintain its current land base in good condition and with intact ecosystems. In addition to the obvious benefits to community relations and to ensure the future use of such lands for military training, it is also important for the military to have non-degraded landscapes to use as part of its training regime. It is essential for the complete training of military personnel that a mix of training occurs in both (simulated) urban environments and unaltered natural landscapes with natural terrain features. Because of these concerns, the military has a strong vested interest in maintaining natural landscapes and fully functioning ecosystems on its training lands.

In an effort to conduct land management from an ecosystem-wide perspective, the USAG-AK (U.S. Army Garrison, Alaska) ecosystem management program was created. Planning for the program was initiated in 1999 and implementation started in 2002, coinciding with the implementation of the Integrated Natural Resources Management Plan for 2002–2006 (U.S. Army Alaska 2001). The ecosystem management program is broadly-based and relies heavily on the principles of both conservation biology (Soule 1986) and landscape ecology (Forman 1995). It variously follows the recommendations and experiences of a number of authors working in ecosystem management, including Grumbine (1994), Noss and Cooperrider (1994), Kohm et al. (1996), Yaffee et al. (1996), Leslie et al. (1996), and Boyce and Haney (1997). The concept of managing complete ecosystems is a relatively new approach to land management and is largely a response to the recognition that single-species management and local scale conservation efforts do not, in many cases (despite the best intentions of land managers), serve to support the processes that keep larger ecosystems functioning. With broader ecosystem approaches to management, both the spatial and ecological scale of management efforts is greatly expanded so that management is conducted for many species over much larger geographic regions. Ecosystem management also recognizes that humans have been and will continue to be part of the landscape, and it endeavors to integrate human and non-human uses of the land. Importantly, ecosystem management seeks to place management actions within a larger landscape context, specifically recognizing that the effects of actions at a local scale, for example, can have larger ramifications at a landscape scale.

This management plan describes the goals, policies, and operating procedures of the USAG-AK ecosystem management program.

### SA1.1 Program Purpose

The ecosystem management program is designed to provide the overall structure and perspective under which land management activities will be conducted at USAG-AK. USAG-AK maintains that only by making land use decisions within the context of the entire landscape (and also in recognition of adjacent land areas managed by other entities, see Section SA4, Ecosystem Management Program Procedures) can reasonable decisions be made for the future. One of the primary functions of the ecosystem management program is to provide a set of landscape-scale tools to aid in making land use decisions. Essentially the ecosystem management program acts as a filter for land management and land alteration proposals by placing them in an ecosystem and larger landscape perspective. Another important function of the Ecosystem Management Program is that it directly specifies a continuum of land use types ranging from areas of intensive human use to areas where use by wild species is the dominant form of land use. These land use designations are superimposed over a landscape mosaic of vegetation types. The maintenance and improvement of this landscape mosaic by active or passive management (as appropriate) is a primary goal of the ecosystem management program, and to this end, the program also serves as a source of ideas for specific land management projects.

## SA1.2 Program Goals and Objectives

The overall goal of the ecosystem management program is to maintain an environment in which Soldiers can train to a high-level of military readiness and to maintain natural landscape features and ecosystem integrity at a broad landscape scale. The set of specific program objectives to be accomplished in pursuit of this goal are:

- Work with the Integrated Training Area Management program to integrate landscape-scale land management efforts with the needs of military training.
- Promote recreational use in ways that do not compromise the military mission or the maintenance of ecosystem integrity.
- Engender support for the protection of natural landscapes and ecosystem processes required for the training and testing necessary to maintain military readiness.
- Incorporate the concept of conservation of ecosystem integrity in the Integrated Natural Resources Management Plan process, the Integrated Training Area Management program, and other planning protocols.
- Promote the general use of proactive planning methods to avoid prolonged controversy over land use proposals and environmental compliance processes.
- Continue to upgrade the process used to target priority species to be managed.
- Outline inventory and monitoring needs to determine current levels of species diversity and to monitor population sizes of selected management priority species.
- Outline habitat-use studies needed to increase the accuracy of habitat preference data used in impact assessment and conflict-resolution procedures.
- Outline habitat management projects that may be needed to maintain the desired landscape scale habitat mosaic (so as to promote species diversity and desired population sizes for a suite of management priority species).
- Continue to fine-tune the landscape-scale impact assessment and conflict-resolution procedures so that multiple species can be more easily assessed.
- Incorporate measures of habitat fragmentation and habitat connectivity into impact assessment and conflict-resolution procedures.
- Coordinate natural resources program with other management agencies and conservation organizations with similar interests.
- Encourage internal and external stakeholders to become involved in the ecosystem management process as it develops.
- Promote management relationships with adjacent landholders so that larger, regional-scale efforts at land management can become a reality.

### SA1.3 Program Justification

The many activities prescribed under ecosystem management as necessary for the long-term conservation of ecosystem integrity constitute a large commitment. USAG-AK believes strongly in the ecosystem approach to land management and is willing to make this commitment. Although ecosystem management is not mandated by law, its implementation is a proactive approach that will help in the process of complying with existing environmental laws such as the Endangered Species Act, Sikes Act, Clean Water Act, and the National Environmental Protection Act.

## SA2. Elements of Ecosystem Management

### SA2.1 Ecosystem Integrity

Relative to traditional land management activities on military lands (focused on game and fish), ecosystem management formalizes a more ecologically comprehensive approach to land management, and seeks to maintain ecosystem integrity across large landscapes. The concept of ecosystem integrity, sometimes referred to as biodiversity, includes both biological diversity as well as the ecological and evolutionary processes that contribute to the maintenance of functioning ecosystems and the creation of biological diversity itself. Ecosystem integrity also encompasses several ecological levels and geographic scales, from ecosystem diversity, community diversity, species diversity, to genetic diversity (Noss and Cooperrider 1994). The primary methods ecosystem management uses to maintain ecosystem integrity are to manage for a large number of species, manage for a variety of habitats and structural vegetation types, and to maintain natural landscape features. If these are accomplished, natural ecosystem processes should continue on the landscape.

It would be incredibly difficult, of course, to directly manage for every important species in the ecosystem (even if funds were available), so some selection process is needed. The USAG-AK ecosystem management program strives to make the selection of species for management as objective as possible, and selects species that represent different levels of ecological importance, rarity and endangerment, and socioeconomic importance (see Section SA4, Ecosystem Management Program Procedures). The ecosystem management program primarily uses a habitat-based approach in its management of wild species, largely because without available habitat, the perseverance of species over time is impossible. In addition, by maintaining and/or improving habitats for target species, an assemblage of species and ecosystem processes not specifically targeted for management will also benefit, thus approaching the goal of maintaining ecosystem integrity.

### SA2.2 Spatial Scale

One of the essential elements of ecosystem management is to manage at spatial scales large enough to encompass the meta-populations of many of the larger plants and animals, and to allow for seasonal movements and inter-generational dispersal between habitats. This necessitates management at large, regional spatial scales. In the early stages of the USAG-AK ecosystem management program, the program will be concerned mostly with the ecological effects occurring within the Army property boundaries. This is a self-imposed limitation so that managers can focus on the mechanics of managing for many species simultaneously. Using these artificial (not ecologically defined) boundaries means that, at the current time, the ecosystem management program really only encompasses complete ecosystems for some of the smaller resident species. This will change as the ecosystem management program fully embraces a broader ecosystem approach, expands its geographic scope, and invites adjacent landowners to join in the program.

### SA2.3 Human Land Use in Ecosystem Management

The basic strategy of the ecosystem management program, in attempting to both maintain ecosystem integrity and promote military training, is to integrate the use of the land by a large number of species, including humans. Critical to this ecosystem management program and a common theme in many ecosystem management programs (Grumbine 1994, Yafee et al. 1996), is the treatment of human land use as a component of the ecosystem. Under ecosystem management, humans are not viewed as outsiders, but as members of ecosystems, just as other wild species are members of ecosystems. That is, human land use is not seen as something artificial but rather as simply another ecosystem component to be managed. Just as wild species have preferences for habitats, so the military and the recreationist have habitat preferences, based on the type of training or hunting or fishing being conducted. Ecosystem management simply addresses facts such as these directly, and in the USAG-AK ecosystem management program, human use of the land is included in the land management model at the start (see Section SA4, Ecosystem Management Program Procedures).

## SA3. Ecosystem Users

Under the ecosystem management program, USAG-AK will promote the use of Army lands by humans (primarily military training and recreation, see below) and also take direct steps to maintain a high level of ecosystem function. The primary users of the USAG-AK ecosystems are briefly described below.

### SA3.1 Human Use

USAG-AK is on public domain land withdrawn for military purposes and therefore, among human users, the military has primary use of the land. The Integrated Training Area Management program exists to spread that use across the landscape in areas that fit best the type of training being conducted. This minimizes disturbance to the ecosystem from the military mission. Military use, however, does not occur at all locations at all times of year. This allows for recreational users, subsistence users, and commercial users to utilize USAG-AK lands in varying degrees.

#### SA3.1.1 Military

The military uses the landscape of USAG-AK in various ways. At a broad scale, lands can be separated into urban areas and training areas. Urban areas include most of the developed areas where housing, offices, and support services are located. Training areas are utilized for maneuver training and weapons training. Maneuver training requires large blocks of land as space is needed for ground and air combat forces to practice movements and tactics. Different units may work in support of one another (combined arms) or a unit may operate on its own. Areas used for maneuver training include bivouac sites, drop zones, landing zones, artillery and mortar firing points, and other miscellaneous training sites. Weapons training also has land-based requirements. Weapons training occurs primarily on firing ranges, and munitions from firing ranges land in surface danger zones or impact areas.

#### SA3.1.2 Recreation and Subsistence

Resource-gathering activities such as hunting, trapping, fishing, firewood cutting, and berry picking all have land-based requirements. Other recreational activities such as off-road vehicle use, skiing, boating, and bird watching, although non-consumptive, also have land-based requirements.

### SA3.1.3 Natural Resources Management

There are a number of natural resources management land uses that have spatial components and land-based requirements. These include forest management, fish and wildlife management, habitat management, wetlands management, watershed management, fire management, endangered species management, special interest areas management, pest management, and minerals management. In addition, the management of cultural resources also has a spatial component.

### SA3.1.4 Commercial

Commercial timber sales are the primary commercial use that has a spatial component and land-based requirement.

### SA3.1.5 Rights-of-way, Easements and Leases

There are a number of existing rights-of-way, easements, and leases on USAG-AK lands. For example, the Glenn Highway at Fort Richardson, the Alaska Department of Fish and Game fish hatchery at Ship Creek (Fort Richardson), the Trans-Alaska Pipeline System through Donnelly Training Area, various powerlines, and outgrants all have land-based requirements.

## SA3.2 Land Use by Wild Species

At least 158 bird species, 38 mammals, 16 fish, and 1 amphibian have been recorded or are probable on USAG-AK lands (U.S. Army Alaska 2001). The number of plant species occurring is large for a northern locality, primarily reflecting the diversity of habitats available, from rocky alpine to lowland bogs and aquatic areas. For vascular plants alone, over 600 taxa have been collected in the area (Racine and Lichvar 1996; Fort Wainwright Land Condition Trend Analysis data 2003). All of these species, of course, depend on habitats available on USAG-AK.

# SA4. Ecosystem Management Program Procedures

There are seven major procedures or components that are integral to the successful execution of the ecosystem management program:

- Inventory and monitoring of biological resources
- Selecting priority species for management
- Habitat-based approach to management
- Habitat preference information for management priority species
- Evaluating conflicts in land use issues
- Specification of the land use mosaic
- Regional management efforts

Descriptions of each of these components of the ecosystem management program, their objectives, methods, and critical tasks for implementation are presented below.

## SA4.1 Inventory and Monitoring of Biological Resources

The monitoring of biological resources at USAG-AK started in the mid-1970s with the implementation of annual Alaska Department of Fish and Game efforts at monitoring the moose population on post. Systematic efforts at biological inventories only started in earnest in the mid-1990s with the advent of

DOD Legacy Resource Management Program funds that were used to inventory birds and mammals and vascular plants (Anderson et al. 2000; Racine and Lichvar 1996). Also at that time, the Land Condition Trend Analysis (now known as Range and Training Land Assessment) program was implemented to monitor vegetation and land condition. Under the ecosystem management program, these efforts will be expanded to update inventories, as needed, and especially to implement monitoring efforts for selected management priority species.

### SA4.1.1 Inventory and Monitoring, Goals and Tasks

The primary goals of the inventory and monitoring component of the ecosystem management program are to determine the current assemblage of species that use USAG-AK lands, track the influx and spread of invasive species, and to quantify and evaluate trends in population sizes of selected management priority species. These efforts will be restricted to birds, mammals, and vascular plants. These goals will be achieved by the application of specific inventory and monitoring projects tailored to the needs of the ecosystem management program.

Inventory efforts will be conducted only periodically, as needed, and will be focused on determining the presence of species expected to occur in the area, but not yet documented. For monitoring, at least initially, species of high conservation concern will be preferentially selected for study. These inventory and monitoring projects will either be coordinated in-house by USAG-AK natural resources staff, utilizing seasonal employees, or contracted to other government agencies or the private sector, as appropriate, considering the circumstances and availability of funds.

### SA4.1.2 Inventory and Monitoring, Methods

Inventory and monitoring will be conducted following standard methods as appropriate for the species group under study. USAG-AK natural resources personnel have strong applied skills and experience studying birds, mammals, and vascular plants and, in consultation with experts on the taxa or group being studied, will determine the best methods to use in each study.

## SA4.2 Selecting Priority Species for Management

The determination of which species to manage was not done in any systematic way until the ecosystem management program was implemented in 2002. Previous to the ecosystem management program, species were selected primarily based on input from federal and state management agencies (e.g., U.S. Fish and Wildlife Service and Alaska Department of Fish and Game) or, in the case of moose and caribou, because of their status as large and ecologically important game species. Under the ecosystem management program, a protocol was established to determine whether or not a species should be managed based on considerations generated from an ecosystem approach to management, and, in addition, a priority ranking system was created to determine which species, of those selected, are most important for management.

### SA4.2.1 Priority Management Species, Goals and Tasks

The goal in selecting species for management is to use a reasonably objective method to determine which species to manage, a method that is based on considerations of maintaining ecosystem integrity in the larger ecosystems that occur on and around USAG-AK lands. The necessary tasks required to establish this selection process have already been completed (see below), but the process will continue to be refined as input is received from reviewers of the ecosystem management program and stakeholders.

### SA4.2.2 Priority Management Species, Methods

To be included for management in the ecosystem management program, a species must occur in at least one of four categories:

- The species is of conservation concern, as determined largely by population declines noted broadly throughout the species range (not necessarily in Alaska) or from conservation priority species lists produced by the U.S. Fish and Wildlife Service, Alaska Department of Fish and Game, and especially specialist working groups (for birds, the national Partners-in-Flight Watch List, the Alaska Audubon Watch List, Boreal Partners-in-Flight Working Group, Alaska Shorebird Working Group, and Alaska Loon Working Group, and for vascular plants, the Alaska Natural Heritage Program,).
- The species has socioeconomic importance as a locally hunted game animal.
- The species is ecologically important in ecosystems as a predator.
- The species is ecologically important in ecosystems as prey.

For example, the management priority species list generated for Fort Wainwright contains 36 birds, 31 mammals, 6 fish, 1 amphibian, and 16 vascular plants. Each of these species was prioritized to determine its relative priority for management. This prioritization process involved using a set of ten ranking criteria that address each species' biology and ecology relative to its response to human-induced disturbances and alterations of habitats (high ranking species are likely to be less common and/or more susceptible to impacts). Each species was given a score of 1–5 for each ranking criteria and the (unweighted) values were summed for all ten criteria, which resulted in high values for high priority management species. With these priority rankings in hand, the large set of 90 selected species (above) was reduced to a manageable "short list" of 23 high priority species deemed most important for management. This short list of high priority management species for each post will be used in most cases for impact assessment and conflict resolution in land use issues (see below).

## SA4.3 Habitat-based Approach to Management

As mentioned above, because it is nearly impossible to monitor populations of all the important species occurring in any single ecosystem, the ecosystem management program primarily relies on a habitat-based approach to management (augmented by monitoring efforts for a few select species, see Section SA4.1, Inventory and Monitoring of Biological Resources, above). The advantages of a habitat-based approach are (1) habitats are extremely important in that they are critical for the continued survival of animal and plant populations, (2) habitats can be directly managed to improve, restore, or create habitats for some species, primarily by manipulating vegetation, and (3) when habitats for target species are maintained and/or improved, other non-target species and interactions among species (i.e., ecosystem processes) will be indirectly managed.

### SA4.3.1 Habitat-based Management, Goals and Tasks

The goals and tasks for the habitat-based approach to management have already been achieved in that the approach has been defined and is currently in use (see below). The approach will continue to be refined, however, as input is received from reviewers of the ecosystem management rogram and stakeholders.

### SA4.3.2 Habitat-based Management, Methods

The central method in using a habitat-based approach to management is to produce accurate landcover (habitat) data for the area, as management can only be as good as the landcover data that is used in management decisions. For this purpose, the primary landcover data are the ecotype classes derived from ecological land surveys and classifications of each post (Jorgenson et al. 1999, 2001, 2003). The ecotypes represent not only vegetation types, but also incorporate ground surface forms and geomorphology to more accurately depict habitat classes. Flexibility also is built into the production of ecotype classes (in a Geographic Information System) so that ecotypes can be broken down into their constituent parts, allowing a customized creation of habitat types for any particular species, if needed.

## SA4.4 Habitat Preferences of Management priority Species

Critical to the ecosystem management program are data for each of the management priority species that indicate their use of habitats. These data are used to determine which habitats are important for each species and which are not, and the data play a pivotal role in impact assessments and in helping to resolve land use conflicts (see Section SA4.5 below).

### SA4.4.1 Habitat Preferences, Goals and Tasks

The goal of the habitat preferences component of the Ecosystem Management Program is to determine the habitat preferences for each management priority species and create and maintain spatially explicit data for each species in a Geographic Information System. This goal has only been partially achieved to date. For instance, although habitat preference data have been coded for each of the approximately 100 management priority species at each post, Geographic Information System data have only been created for the species on the management priority short list (25 species for Fort Richardson, 23 for Fort Wainwright and 21 for Donnelly Training Area). The determination of habitat preferences for the management priority species is an ongoing process, and will be continually refined as additional data are discovered (that were not used previously) or new data are collected from habitat use studies recommended by the ecosystem management program.

### SA4.4.2 Habitat Preferences, Methods

Habitat preferences for each management priority species were assigned using the combined knowledge of many biological field workers familiar with Alaska and local knowledge of the natural history. Because quantitative data are lacking in almost all cases, habitat preferences were assigned qualitatively in three broad use categories (negligible/low, medium, or high use). The methods used to determine habitat preferences were simply to gather as much published and unpublished data on habitat use as possible for each species and then to equate those data to the ecotype (habitat) classes by Jorgenson et al. (1999, 2001, 2003). For resident species, habitat preferences were assigned for habitats used during both the summer and winter months, and, for migrant birds, preferences were assigned primarily for breeding habitats and, in the case of waterfowl and shorebirds, migration staging habitats as well. The methods and problems encountered in determining habitat preferences for the management priority species are discussed in detail by Schick (2003). For many species there is a paucity of data on habitat use, and in these cases habitat preference information was assigned primarily by using the local field experience and best professional judgment of USAG-AK staff and others (e.g., U.S. Fish and Wildlife Service and Alaska Department of Fish and Game staff) who have worked on USAG-AK lands and surrounding environments.

## SA4.5 Evaluating Conflicts in Land Use Issues

One of the important components of the ecosystem management program is the protocol designed specifically to infuse spatially-explicit data into the process of making land use decisions. Using this protocol, whenever a land alteration activity is proposed, a quantification is made of the extent of loss (or gain) of preferred habitats for a number of high priority management species. Notably, these losses (or gains) in habitat areas are then evaluated on a landscape basis, using metrics from landscape ecology, to assess the overall impact to habitats for the set of species being evaluated. This protocol is typically used to evaluate proposed alterations of the landscape from construction activities or habitat management activities, but it also can be used in advance of other land use activities (i.e., recreational use and military training use which do not involve land alteration) to determine where conflicts in land use between humans and wild species are likely to occur and where they may be avoided. In the latter case, the protocol serves in a proactive role, providing data to land managers who may want to avoid the scheduling of activities in which land use conflicts are likely to occur.

### SA4.5.1 Evaluating Land Use Conflicts, Goals and Tasks

The goals and tasks necessary for implementation of the protocol to help resolve conflicts in land use activities have already been achieved in that the protocol has been defined and is currently in use (see below). The protocol will, of course, continue to be refined as managers evaluate it's effectiveness in helping to resolve land use conflicts, or hopefully, in avoiding them altogether.

### SA4.5.2 Evaluating Land Use Conflicts, Methods

The first step in the protocol to evaluate land use conflicts is to determine which species should be evaluated. All analyses done to date have used a subset of the high-priority management species determined for each post (see Section SA4.2.2 above). This approach to the selection of species to be evaluated (which was designed primarily to limit the number of Geographic Information System analyses needed for a particular evaluation) resulted in no analyses being conducted for some species of increasing conservation concern (e.g., blackpoll warbler). Future analyses will use a broader range of species (selected from the full list of roughly 100 management priority species) and analyses will be conducted specifically for those management priority species that have been shown to be experiencing population declines in some part of their range and/or for which habitats are rare or difficult to recreate.

To evaluate potential conflicts whenever there are proposed changes in land uses or proposed land alterations on Army lands, the data layers representing each selected species' habitat preferences are used (see Section SA4.4.2 above). In the first step, the method involves nothing more than sequentially overlaying the proposed changes to the landscape (in a Geographic Information System) on top of each of the data layers representing the preferred habitats for the managed species. With these data in hand, USAG-AK can determine what habitats are likely to be affected and how many acres would be involved. In the second step, the predicted changes in habitats for each species can be evaluated by quantifying the amount of preferred habitat remaining for each species elsewhere on post (a landscape-scale assessment) and also assessing the geographic pattern of those habitat patches. That is, in addition to changes in total habitat acreage, the potential effects of habitat fragmentation on both the size and connectivity of remaining habitat patches can be taken into account to help decide whether a proposed habitat change may be biologically significant or not. Such analyses are readily conducted with Geographic Information System data using the FRAGSTATS software package (McGarigal and Marks 1995).

Note that these evaluations of potential conflicts in land use issues will not eliminate the hard choices that have to be made, but they will provide much needed data for a number of species that have traditionally been overlooked in such land use decisions. These data will also provide a larger, landscape and multi-species perspective from which to make land use decisions.

## SA4.6 Specifying the Land Use Mosaic

Another critical component of the ecosystem management program is the direct specification of human land uses for each part of the post. Here is where designations are used to set aside areas for intensive use by humans and where other designations result in the primary use of the land by wild species.

### SA4.6.1 Specifying Land Use Mosaic, Goals and Tasks

The overarching goal for designating a range of human land use areas is to promote the use of the land for military training and also promote use by wild species. The patterns of human land use were, in a very real sense, inherited from the land uses of previous generations, and through the ecosystem management program, managers have circumscribed and explicitly defined these land uses spatially and these data are now maintained in a Geographic Information System. The ecosystem management program will be the vehicle for managers to use to direct future patterns of land use on post. The primary task involved in this land use designation process is one of annually evaluating the land use pattern, at a landscape scale, to ensure that the pattern of land use is consistent with the maintenance of the desired vegetation mosaic. The desired vegetation mosaic is one that is conducive to sustaining ecosystem integrity and also allows for military training.

### SA4.6.2 Specifying Land Use Mosaic, Methods

The primary method used to designate land use types was to first determine how the military (the primary human land user) uses each portion of each post. This was done using a combination of aerial photo interpretation, field data, and information derived from the Range Control office (the entity charged with scheduling all training events). These data were collected first as part of the Range and Training Lands Assessment program, and have been adapted for the ecosystem management program. For example, approximately 83% (768,463 acres) of the land at Fort Wainwright is designated as foot use only. This means there is only sporadic activity by humans in these areas and indicates, in effect, that the primary land use in these areas is by wild species. These foot-use areas have received very little habitat alteration and ecosystem integrity there remains high. In contrast, less than 1% (5511 acres) of Fort Wainwright is designated as urban and is reserved for intensive human use.

To maintain this land use mosaic in a form that is conducive to sustaining ecosystem integrity, the ecosystem management program will hold annual meetings to evaluate whether there has been any significant change in the land use pattern over the previous year. Formal analyses of land use patterns, using metrics from landscape ecology, will be employed to objectively determine differences in land use patterns among years. Key variables to be evaluated will be habitat fragmentation, habitat patch size, and habitat connectivity. The vehicle used to monitor changes in the land use pattern is the Range and Training Land Assessment program, which is charged with sampling vegetation and land condition in each of the land use types discussed here.

## SA4.7 Regional Management Efforts

This component of the ecosystem management program involves USAG-AK's efforts to manage its lands with an explicit understanding of the broader, landscape ecological contexts in which those lands function. Efforts at broader-scale management of the region in which each post exists will require communication and cooperation with adjacent land owners and stakeholders. This component of the ecosystem management program is in the early stages of development but some progress has already been made (see Section SA4.7.2 below).

### SA4.7.1 Regional Management Efforts, Goals and Tasks

The primary goal of regional management efforts is to fully embrace an ecosystem approach to management, especially with respect to the larger mammals that use large tracts of land during their life histories. The tasks for regional management efforts are varied, but most involve communication with adjacent landowners and stakeholders to develop working relationships, with the ultimate goal of coordinating shared land management efforts at some point in the future.

### SA4.7.2 Regional Management Efforts, Methods

There are no set methods for this component of the ecosystem management program; but rather, there is at the current time a set of projects which illustrate the work USAG-AK plans to develop under this component of the ecosystem management program.

USAG-AK also is currently working to establish a long-term monitoring program for landbirds. The goals of this monitoring program are to both collect habitat preference information to be used directly in the ecosystem management program, and also for the Army to contribute to the statewide effort at monitoring neotropical migrant and resident landbirds across the state of Alaska.

Other regional-scale projects at Fort Wainwright include cooperation with the Alaska Department of Fish and Game on prescribed burn plans for lands west of the Wood River on the Tanana Flats. Fort Wainwright and Donnelly Training Area contribute support to the restoration plan for the Fortymile caribou herd. The Fortymile caribou herd uses a broad area in eastern interior Alaska and adjacent areas in the Yukon Territory. Other Donnelly Training Area regional-scale projects include cooperation with the Alaska Department of Fish and Game on the production of grazing plots for bison.

A prime example of regional management efforts is the cooperation between Fort Richardson and the Alaska office of The Nature Conservancy, other state government agencies, and interested individuals to produce an ecoregional assessment for the Cook Inlet Basin Ecoregion. This ecoregional assessment will identify important areas of biodiversity in the region (areas of biological significance) and will outline a plan for broad scale conservation efforts aimed at the entire Cook Inlet Basin Ecoregion. A draft overview of this assessment has been published (The Nature Conservancy 2003), and in that overview, Fort Richardson is included as part of one area of biological significance (which includes the upper portions of Knik Arm and adjacent lands).

Fort Richardson also has cooperated with the Alaska Department of Fish and Game, the U.S. Fish and Wildlife Service, the Municipality of Anchorage, and other interested parties in the production of a wildlife management document that outlines a long-term plan for wildlife management within the municipality of Anchorage (Alaska Department of Fish and Game 2000). In this planning effort, the management actions on Fort Richardson were of prime concern for the management of wildlife in the Anchorage Bowl.

Finally, as part of USAG-AK’s ecoregional approach to management, in the ecosystem management program process each future land management project that is contemplated will be explicitly evaluated for the role it may play in the larger ecoregion that USAG-AK lands function within. Those projects that contribute positively to overall ecoregional goals will receive a higher ranking for funding than projects with only local benefits.

## SA5. Responsibilities

The development and implementation of ecosystem management is primarily the responsibility of the USAG-AK natural resources program. Permitting and coordinating the use of lands on post is the responsibility of Range Control, while the management of natural resources and recreational use is the responsibility of the Directorate of Public Works. All construction activities and land alterations are coordinated by the Directorate of Public Works. The Integrated Training Area Management program coordinates the management of natural resources and recreational use with the use of USAG-AK lands for military training. Most commercial uses and all leases, easements, and rights-of-way must be permitted by the Bureau of Land Management, with concurrence by USAG-AK. Both the U.S. Fish and Wildlife Service and the Alaska Department of Fish and Game play integral roles as stakeholders and advisors in the ecosystem management process, both on the installation and in broader, regional ecosystem management efforts.

# SB. SURVEY AND MONITORING

## SB1. Introduction

The following section details the procedures and standard practices used by USAG-AK for survey and monitoring of its natural resources. These procedures and standard practices are grouped by program area.

## SB2. Watershed Monitoring

Watershed monitoring includes procedures to survey and monitor soils, water, vegetation, and landforms across all USAG-AK lands. Baseline planning level surveys provide “fence to fence” coverage of all lands, while wetlands monitoring, soil and water quality monitoring, and Range and Training Land Assessments provide annual monitoring of the impacts of military training on USAG-AK lands.

### SB2.1 Planning Level Surveys

The Sikes Act (Public Law 86-797) requires that baseline natural resource planning level surveys be completed for all military lands. The Department of the Army, in Memorandum DAIM-ED-N, 21 March 1997, required the completion of seven planning level surveys, including flora and fauna, vegetation communities, wetlands, soils, surface water and topography. The following section details the methods and procedures for completing these seven planning level surveys.

#### SB2.1.1 Fauna Planning Level Surveys

Conduct fauna planning level surveys of birds, fish and mammals on USAG-AK lands. These planning level surveys focus on neotropical, waterfowl, and raptor avian species, salmon, grayling, and other fish species, and small mammal species. This project is a 10-year update to determine trends in faunal biodiversity and improve the quality of the faunal database. An accurate fauna planning level surveys is required by AR 200-3 and is required to implement this Integrated Natural Resources Management Plan as mandated by Public Law 86-797 (Sikes Act). Per Memorandum DAIM-ED-N, 21 March 1997, this planning level survey is a class 1 requirement.

- Complete, maintain, and update a fauna planning level survey.
- Complete, maintain, and update a planning level survey for threatened, endangered, or species of concern.

#### SB2.1.2 Floristic Planning Level Survey

Conduct a floristic survey on all USAG-AK lands. This project is the 10-year update to determine trends in floristic biodiversity and improve the quality of the floristic database. Floristic inventory activities set the foundation on which many decisions regarding land management are based. An accurate floristic planning level survey is required by AR 200-3, supports compliance with the Endangered Species Act, and is required to implement this Integrated Natural Resources Management Plan (INRMP)as mandated by Public Law 86-797 (Sikes Act). Per Memorandum DAIM-ED-N, 21 March 1997, this planning level survey is a class 1 requirement.

- Complete, maintain and update flora planning level survey.
- Complete, maintain, and update a threatened and endangered flora species survey.
- Identify the requirement for a floristic planning level survey.

### SB2.1.3 Soils Planning Level Survey

Conduct a baseline planning level soil survey on all USAG-AK lands. Identify and map soils, correlate soils to permafrost areas, and establish relationships among terrain components. Soil surveys are essential to establishing a database for planning effective management of withdrawn public lands. Soils data are required for input into the military training and scheduling process. The soils planning level survey is required by AR 200-3, supports compliance with the Clean Water Act, and is required to implement this INRMP as mandated by Public Law 86-797 (Sikes Act). Per Memorandum DAIM-ED-N, 21 March 1997, this planning level survey is a class 1 requirement.

- Complete, maintain, and update a soils planning level survey.
- Complete a topography planning level survey.
- Identify the requirement for a soils planning level survey.

### SB2.1.4 Surface Water Planning Level Survey

Conduct a 10-year update of surface water planning level survey on all USAG-AK lands. An accurate baseline surface water planning level survey is required by AR 200-3 and is required to implement this INRMP as mandated by Public Law 86-797 (Sikes Act). Per Memorandum DAIM-ED-N, 21 March 1997, this planning level survey is a class 1 requirement.

- Complete, maintain, and update a surface water planning level survey.
- Identify the requirement for a surface water planning level survey.

### SB2.1.5 Topographical Planning Level Survey

Conduct a 10-year update of topographical planning level survey on USAG-AK lands. An accurate topographical planning level survey is required by AR 200-3 and is required to implement this INRMP as mandated by Public Law 86-797 (Sikes Act). Per Memorandum DAIM-ED-N, 21 March 1997, this planning level survey is a class 1 requirement.

- Complete, maintain, and update a topography planning level survey.
- Identify the requirement for a topography planning level survey.

### SB2.1.6 Vegetation Communities Planning Level Survey

Conduct a 10-year update of vegetation planning level survey on all USAG-AK lands. Vegetation survey is conducted as part of an ecological land classification that synthesizes results from integrated resources studies to map ecologically sensitive portions of the landscape to facilitate land management and minimize impacts to ecosystems. The project is designed to emphasize three aspects of ecosystem management: the sensitivity and recovery of ecosystems to disturbance, permafrost distribution and relative stability, and the value of wildlife habitats. The identification of ecologically sensitive areas and threats to these areas are critical to management of the entire installation. This project will directly support the military mission by identifying locations where special precautions should be taken during training, and thus, by default, also identifying areas where special precautions need not necessarily be taken. An accurate vegetation communities planning level survey is required by AR 200-3, supports compliance with the Endangered Species Act, and is required to implement this INRMP as mandated by Public Law 86-797 (Sikes Act). Per Memorandum DAIM-ED-N, 21 March 1997, this planning level survey is a class 1 requirement.

- Complete, maintain, and update a vegetation communities planning level survey.
- Identify the requirement for a vegetative communities planning level survey.
- Identify, locate, and map any rare or sensitive vegetation communities.
- Characterize physical and thermal properties of permafrost, analyze relationships of permafrost with other terrain components, model permafrost distribution, and assess the response of permafrost to disturbance.
- Analyze USAG-AK lands for habitat use by passerines and small mammals, and rank them to diversity of wildlife species by relative value.

### SB2.1.7 Wetland Planning Level Survey

Conduct wetland planning level surveys on all USAG-AK lands. The wetland survey includes a wetland classification system based on hydro-geomorphic characteristics of vegetative communities. The project includes a description of values and functions of wetlands along with management recommendations. The National Wetlands Inventory failed to detect many of the smaller wetlands, which rendered it inadequate for installation natural resources management programs. Wetland surveys are required for management of withdrawn public lands. An accurate wetland planning level surveys is required by Army Regulation (AR) 200-3 and is required to implement this INRMP as mandated by Public Law 86-797 (Sikes Act). Per Memorandum DAIM-ED-N, 21 March 1997, this planning level survey is a class 1 requirement.

- Complete, maintain, and update wetland planning level survey.
- Identify the requirement for a wetland planning level survey..

## SB2.2 Soil and Water Quality Monitoring

Groundwater, surface water, and soil monitoring will be conducted to evaluate the presence of munitions residues from the impact area. Monitoring water quality is important for measuring ecosystem health. Soil and water quality monitoring evaluates water quality coming onto and leaving USAG-AK lands and identifies any potential residues leaving the impact area. Water quality monitoring is required to comply with the Clean Water Act and other environmental laws and regulations, as well as to formulate options for managing those species particularly dependent upon high water quality, as required by the Sikes Act and AR 200-3. Soil and water quality monitoring is required by Public Law 106-65 (Military Land Withdrawal Act) as mitigation for the Land Withdrawal Legislative Environmental Impact Statement and Public Law 86-797 (Sikes Act) requires that an INRMP be implemented and updated every five years.

- Annually monitor surface water as it enters and leaves USAG-AK lands to identify potential contaminants or potential contaminant migration.
- Monitor soils and sediments in streambeds along the installation boundary annually to identify potential contaminants or potential contaminant migration.
- Provide appropriate agencies results of sampling studies.

## SB2.3 Wetlands Monitoring

Purpose – establish protocol for monitoring training-related disturbance in wetlands.

1) Obtain schedule of training events from the Range Facility Management Support System.

- Gather information on size of units, location and specific activity.
- The Range and Training Land Assessment Coordinator will check the Range Facility Management Support System schedule once per week and determine monitoring scheme.

2) Classify training events according to potential impact on wetlands (severity of damage and number of acres).

- High impact - major training events, e.g., Northern Edge, Operation Hurricane, and training exercises involving Engineers.
- Moderate to High impact – vehicular maneuver with no surface disruption and/or activities occurring during critical times such as spring break-up or maneuver across frozen but not snow-covered wetlands.
- No to Low impact – foot maneuver activities, e.g. "Expert Infantry Badge" training and orienteering.

3) Establish different levels of monitoring based on frequency, duration, and intensity of training events.

- For High impact events – monitor 50% of exercise duration (includes initial set-up, spot-checking activities and placements, and clearing of areas).
- Spot-check activities involving engineers.
- For Moderate to High impact events – Spot-check maneuver/ training activities during break-up.
- For No to Low impact events – limited monitoring will be conducted on a case-by-case basis.

Disturbed areas will be identified during or shortly after the exercise. Range and Training Land Assessment crews will verify total disturbance acreage. In the following years, Range and Training Land Assessment crews will survey these disturbed/reclaimed areas as distinct land use polygons.

4) Compile monitoring information in an annual report. (The U.S. Army Corps of Engineers may require this report depending on which wetland permits are currently in effect. Reports for Fort Wainwright, to include Donnelly Training Area, will go to the Fairbanks Regulatory office and reports for Fort Richardson will go to the Anchorage Regulatory Office. Additional information may be required.) The report shall include at a minimum:

- Amount of wetland damage (to be compiled and updated on a monthly basis)
- Amount of wetland reclamation (designated as an immediate fix or potential revisit depending on severity of damage)
- Maps showing location and extent of new and cumulative damaged areas (obtained from Global Positioning System points)
- Photos of training activity wetland damage
- Results/comments from U.S. Army Corps of Engineers field visits to areas with heaviest damage

5) Communication with Range Control.

Each unit commander will receive multiple copies of the environmental limitations overlays from Range Control. Individuals will be instructed on the use of the overlays at each Range Briefing; in the Environmental Handbook; in the revised version of AR 350-2, *Range Regulation*; and directly from Range Control before each exercise.

The point of contact between Range Control and Natural Resources will be the Integrated Training Area Management or Range and Training Land Assessment Coordinator.

## SB2.4 Range and Training Land Assessment

The U.S. Army's Range and Training Land Assessment program is the monitoring component of the Integrated Training Area Management program, which seeks to maintain a balance between the use of training lands to maximize military preparedness and the conservation of biologically diverse and functioning ecosystems. These two aspects of land use are not always mutually exclusive, however, as combat training can require the use of non-degraded lands to provide realistic combat situations. To this end the Range and Training Land Assessment program in Alaska is designed to provide data to military trainers on the condition of their training lands with respect to both the ecological condition of the land and the condition of the land in terms of its potential to support training. This information is necessary for decisions to be made regarding the location and timing of training events, and also to provide information necessary to prioritize which sites are in need of restoration. In short, the Range and Training Land Assessment data serve as the primary tool used in land management decisions with respect to military training. These data also provide general botanical information about the post and are the focal point of a long-term monitoring program to evaluate the ecological health of the training areas.

In addition to gathering data on the ecological condition of training lands, the Integrated Training Area Management program coordinates the collection of baseline information such as plant and animal species inventories, soils and wetlands surveys. These data are necessary (e.g., endangered species habitat maps, wetlands maps) as inputs into the decision-making process for scheduling training events. They also provide basic biological and physical data that can be drawn upon when natural resource management decisions must be made.

The Range and Training Land Assessment program was formerly called Land Condition Trend Analysis. During the fall of 2004, the program name was changed to more accurately reflect coordinator job duties. The position and program objectives remain the same.

In the field portion of the Range and Training Land Assessment program, we will conduct surveys in various land use areas with the primary goal of quantifying the land condition in each area. These land use areas are defined by military training activities and are referred to as map polygons. The procedures for sampling each land use area include (1) delineating and mapping the polygons to be sampled (from aerial photography), (2) determining the number and location of transects and sample points to be recorded, and (3) recording the actual data at each sample point. We will be conducting primarily the procedures that fall in category 3.

The daily routine in the field consists of calling in to Range Control to get access to the area we want to work in, finding the start of the transect, navigating to the sample point, taking a representative polygon photo at the sample point (one per polygon), recording a Global Positioning System location for the sample point, and then collecting the rest of the data as follows. We will be recording all our data on hand-held computers, running a customized program that provides multiple screens in which to enter the data. First we will record the types of land use activities that are evident within an envisioned 20m radius surrounding the sample point, and any land maintenance activities that are evident. Then we will record a series of variables we collectively call Site Restoration Priority data. These Site Restoration Priority data are also estimated for the envisioned 20m radius surrounding the sample point. Then using a Daubenmire frame we will record (1) the %age of the frame area which shows any disturbance of the ground surface and the nature of the disturbance (i.e., what caused it), (2) the %age of the frame area which has ground cover and the type of ground cover (in broad categories), (3) the canopy height (the minimum height of plant intersections with the sampling rod) at the four corners of the Daubenmire frame, and (4) the aerial cover of the plants (herbs and shrubs) that cover any portion of the frame area; these are recorded in %age classes. Then with the clinometer we will record the % slope, slope length, and aspect for any slope which occurs across the sampling point. Next we will record the canopy cover above the sample point with the densiometer. Finally, to calculate forest stem density we will record all the trees which are counted as "in" the plot by sighting each tree trunk with a wedge prism. For each counted tree we will record the species, mortality class, and DBH (diameter at breast height). When done for the day, we have to radio Range Control and let them know we are leaving the area.

The complete methodology for Range and Training Land Assessment can be found in the Integrated Training Area Management Plan (U.S. Army Alaska 2005).

# SB3. Forestry and Wildfire Monitoring

Monitoring of the forests on Army lands is accomplished through a system of permanent plots. Forest cover maps are continually updated to capture areas cleared for military mission and burned areas from wildfires. Monitoring is a tool used to assess the forest condition and manage wildfires. Vegetation type and cover is critical to maintaining aspects of military training and monitoring is used as a tool to accomplish this.

## SB3.1 Continuous Forest Inventory

Inventory and monitoring of USAG-AK's forest resources provide an indicator of ecosystem integrity, biodiversity of species and habitats, and sustained production of commercially valuable forest products. In addition, inventory and monitoring help to determine areas where improvements or rehabilitation are needed to maintain ecosystem integrity and to support military training activities. Inventories are conducted by forestry crews from the USAG-AK Natural Resource Forestry Office with equipment purchased for the purpose of conducting these inventories. Two hundred sixty five forest inventory and analysis plots and forest health monitoring plots are located throughout the forested areas of USAG-AK's training lands to date. Plot establishment and measurement procedures follow U.S. Department of Agriculture Forest Service forest inventory and analysis and forest health monitoring guidelines (U.S. Forest Service 2005). Forest inventory and analysis and forest health monitoring permanent plots are an effective method for detecting changes in forest health, composition, structure, forest fire fuel loading, and determining growth and mortality which can be applied in growth projection models. The forest inventory and analysis plots are re-measured every ten years. Forest health monitoring plots are re-measured every five years. Approximately 10% of the forest inventory and analysis plots area also forest health monitoring plots. The periodic re-measurement of permanent sample plots is statistically superior to successive independent inventories for evaluation of changes in forest conditions. Permanent plot locations and intensity are systematically stratified by forest type across the landscape. Stands are sampled to determine tree species composition, size class distribution, understory species composition, canopy cover, crown size and position, stem density, basal area, regeneration composition and density, and merchantable volumes by species.

## SB3.2 Fire History Mapping

Fire history maps are updated annually by obtaining wildfire perimeters from the Bureau of Land Management, Alaska Fire Service's Geographic Information System office. Perimeters of fires smaller than 100 acres, cost, ignition point, and cause are obtained directly from the Military Zone of Alaska Fire Service. Data is consolidated with the previous years in a Geographic Information System. Two data bases are maintained, one of perimeters and one of ignition points. Wildfire and prescribe fire perimeter data is generated from satellite imagery and/or flying the perimeter with a helicopter and recording the data in a Global Position System unit.

## SB3.3 Forest Cover Type Mapping

Forest cover maps are updated annually using fire history perimeters, military construction overlays and overlays of other clearing projects. Forest stands are delineated and attributed on a Geographic Information System using a combination of air photo interpretation, heads up digitizing, and ground truth plot information. Forest stand data attributed in the Geographic Information System comes from forest inventory plot information. Forest stand maps are used for forest utilization planning, identifying specific military training area requirements, military training range location, and natural resource management concerns.

## SB3.4 Fuel Hazard Assessments

Wildfire fuel hazard assessments for structures are performed to stands set by the Firewise program (Firewise 2002). All vegetation should be actively managed to reduce fire risk within 30 feet of a structure. Trees should be pruned and spaced at least 10 feet apart out to 100 feet from a structure. Standard assessment forms are used to survey structures. The forms were developed by the Bureau of Land Management, Alaska Fire Service and look at vegetation, building material, location and hazardous material storage. Assessments are updated annually with new structures. Structures are visited on a five year rotation system. Assessment data is stored in a database which is linked to a Geographic Information System with aerial and ground photos of the structures. Fuel assessments at a landscape scale look at vegetation flammability, weather, historical fire patterns, fire behavior and proximity to values at risk. Areas with continuous black spruce leading to high value locations receive the highest concern. Wildfire vegetation fuels maps are updated annually along with forest stand maps. The fuels maps reside in a Geographic Information System and are updated using wildfire and prescribe fire history data, construction and land clearing overlays, aerial photos, and ground truth plot information. Fuels maps are used for wildfire and prescribe fire planning, military training range location, and hazard fuel assessments. Fuels maps follow the Canadian Fire Behavior Prediction System fuel types (Forestry Canada Fire Danger Group 1992).

## SB3.5 Wildfire Identification and Reporting

All wildfires are to be immediately reported to Range Control. Range Control will then notify the Bureau of Land Management, Alaska Fire Service and/or the military fire department.

## SB3.6 Wildfire Resource Advisor

Wildfire progress monitoring is conducted by the Bureau of Land Management, Alaska Fire Service. Updates can be obtained on their web site http://fire.ak.blm.gov/. Updates for fires were suppression action is required can also be obtained by contacting the public information officer at Alaska Fire Service. The USAG-AK installation forester acts as a liaison with the wildfire incident command staff on an as-needed basis conveying land management concerns and providing institutional knowledge of the land. The USAG-AK installation forester also relays information from the wildfire command staff to the various installation directorates. This function is known as a resource advisor in the wildfire incident command system.

## SB3.7 Wildfire and Prescribed Fire Monitoring

Wildfires are monitored for several years after a burn to determine vegetation response, identify erosion issues, and determine if fire suppression actions have been adequately rehabilitated. Monitoring is conducted using a combination of aircraft flyovers, photo points, vegetation plots, and permanent sample plots following forest inventory procedures. Prescribe fires are monitored to determine if burn objectives are met, determine fuel loading, and identify rotational periods between burns. Prescribe fires are used as a tool to reduce fuel loading on ranges where the risk of wildfire limits military training opportunities. Monitoring is conducted using a combination of aircraft flyovers, photo points, vegetation plots, and permanent fuel loading sample plots following procedures outlined by Brown (1976).

# SB4. Fish and Wildlife Monitoring

Fish and wildlife monitoring includes procedures to survey and monitor fish and wildlife across all USAG-AK lands. The following section includes procedures, standard practices, and methods for monitoring birds, bear, moose, caribou, bison, small mammals, furbearers, fish, and beluga whales.

## SB4.1 Avian Monitoring

USAG-AK uses a number of methods to monitor birds. Breeding Bird Surveys (BBS), Measuring Avian Productivity and Survival (MAPS), breeding bird checklists, point counts, constant effort mist-netting stations (off-post at Creamer's Field) and aerial surveys (trumpeter swans, Tanana Flats Training Area) are conducted (or have been conducted) to monitor avian species on USAG-AK lands.

### SB4.1.1 Breeding Bird Surveys

In 2003, USAG-AK started implementation of a long-term breeding bird monitoring program as part of the Alaska Off-Road Breeding Bird Survey on all three posts. U.S. Fish and Wildlife Service was contracted to complete sampling methodology and execute data collection and data reporting.

Bird counting procedures are standardized throughout the Breeding Bird Survey program. Each route consists of 50 stops placed at 0.8-km (0.5-mile) intervals along a 39.4-km (24.5-mile) stretch of road. Routes are surveyed once each year by an observer who is familiar with the sight and song of birds in the region. At each of the stops, the observer records the number of individuals of each species heard or seen during a 3-min period; only birds detected within 0.4 km of the road are counted. Surveys begin 30 minutes before sunrise (no earlier than 0230 hr in Alaska) and are completed within 4-5 hr. Most Alaska routes are surveyed between the second and fourth weeks of June. Because of differences in the skills of observers, the same observer is encouraged to survey the route for a number of years.

Aerial monitoring of trumpeter swans and nesting locations are flown every even year in the Yukon Training Area and on areas at Donnelly Training Area. A Global Positioning System location is recorded and the nest is monitored for hatchling and fledging success when possible.

Atlas surveys are used to determine species distribution and abundance on a base-wide scale. In this survey, biologists systematically search the post for bird species throughout the months of June and July, following the methods of Andres (1995).

The Monitoring Avian Population Survey is a long-term, nationwide study designed to quantify demographic patterns in migratory bird populations.

### SB4.1.2 Eagle River Flats Waterfowl Monitoring Protocol

Methodology. All Eagle River Flats waterbird surveys will be conducted by fixed-wing aircraft. Aerial transect surveys are to be patterned after standard Department of Interior aerial survey techniques. Approximately 10 parallel transects will be flown twice, in opposite directions, during each survey. Transect lines will run generally in a north/south direction from tree line on the south side of Eagle River Flats to the coast of Knik Arm on the north. Due to considerable variability of water conditions, lighting conditions, and numbers of birds on Eagle River Flats the transect endpoints are not fixed points and may vary depending on conditions. The controlling factor will be complete coverage of suitable habitat for waterbirds in Eagle River Flats with good visibility under existing conditions at the time of the survey. Surveys will be conducted at maximum altitude of 75 meters and airspeed of 100-150 km/hour. Surveys will be started on the west side of Eagle River Flats and proceed inland. The observer will sit on the right side of the airplane and count all waterbirds on the right side out to a maximum of 200 meters. The pilot will initiate the first transect at a distance from the tree line indicated by the observer, not to exceed 200 meters. At the end of the transect the pilot will turn and fly the same transect in the opposite direction, allowing the observer to count in the opposite direction using visual landmarks to mark the outside edge of that transect. The pilot will initiate the next transect at a distance not to exceed 200 meters to the side of the previously used visual landmarks and establish new visual landmarks for the next transect. This procedure will be repeated until the entire Eagle River Flats area has been surveyed.

Survey Timing – Surveys will be conducted approximately once per week from April through October as weather and airspace restrictions allow. Due to restrictions placed on air space availability over Eagle River Flats by U.S. Army training mission it is not possible to standardize survey timing to tide levels or time of day. Surveys will not be conducted before 09:00 or after 19:00 to maximize lighting conditions. Surveys will not be conducted in rain or with winds in any direction greater than 20 knots.

Data collection. The observer will use a cassette tape recorder to record all observations of waterbirds. The observer will utilize a USAG-AK Geographic Information System Eagle River Flats map with most permanent ponds identified with standard numbers from the Eagle River Flats Cold Regions Research Engineering Laboratory pond data base. The observer will identify and count birds and indicate specific area for all observations, and pond number when possible. Data will be transcribed from tapes and entered in a standard data base for analysis.

The following information will be obtained and annotated:

a. Date: dd/mmm/yyyy format, e.g., 10 Jul 2005.

b. Time: 24 hour time. Start and end times of survey periods and time of sightings using digital timepiece and accurate synchronized time obtainable from http://www.time.gov/timezone.cgi?Alaska/d/-9/java.

c. Optics: Indicate what optics if any are being utilized during the observation period.

d. Observer: Names and initials of observers.

e. Environmental conditions: To be recorded every hour including air temperature, cloud cover, precipitation, wind speed and direction, visibility.

f. Numbers of animals observed: All species are counted when possible, and when in flocks, flock size is estimated.

(1) Geese and ducks: All geese and ducks are to be identified to species when possible or labeled "unknown dabbler or unknown diver" when identification is not possible.

(2) Gulls and shorebirds: Gulls are to be recorded as large or small, and shorebirds are recorded but not classified by species.

(3) Bald eagles: Bald eagles observed in trees bordering Eagle River Flats and on Eagle River Flats are to be recorded as adults or immature.

(4) Sandhill cranes, ravens, and other raptors: Sandhill cranes, ravens, and other raptors observed are to be recorded.

(5) Beluga whales: Beluga whales observed in the river and in Eagle River Bay are to be recorded.

(6) Moose, brown and black bears, and wolves: Observations of moose, brown and black bears, and wolves within Eagle River Flats or along the shoreline are to be recorded.

g. Comments: General comments as to behavior observed, grouping etc.

h. Photographic documentation: To be obtained as is practicable.

### SB4.1.3 Owl Surveys

Nationally, increasing interest concerning the distribution, population status, and habitat use by nocturnal raptors has led to the establishment of owl surveys and studies. Not much is known about the owl species inhabiting and utilizing Fort Wainwright Main Post, Tanana Flats Training Area, Yukon Training Area, or the Donnelly Training Area. For example, what species are in what areas? Many owls are seen and heard during the year, but natural resource managers know little more. Birds of prey occupy the top of the food chain and may be susceptible to environmental toxins and contaminants, making them important to monitor as indicators of environmental health. The understanding of distribution, relative abundance, and density of wildlife populations would be valuable for sound management decisions and practices on military lands.

Nocturnal behavior and the early breeding season lends to the difficulty in detecting owls when using traditional methods of monitoring bird populations (e.g., Breeding Bird Survey routes, Breeding Bird Atlases, Christmas Bird Counts, and migration monitoring). Several regions in the United States, Canada and Alaska have effectively implemented volunteer-based nocturnal surveys in an attempt to monitor owl populations.

Nocturnal raptors are top predators and can be used as indicators species for the overall health of an ecosystem. Habitat and prey needs determine the presence or absence of top predators. Management of Army lands can influence both needs. Although owls may not be of economic importance as other top predators like Lynx, they do provide valuable information on prey abundance and availability, as well as aesthetic value to many bird watchers. The surveys are an easy way to study owl populations and compare North American trends. It is recommended that Fort Wainwright maintain and perhaps expands the survey system, providing yet another source of information available for appropriate and efficient management planning. Furthermore, because the survey is standardized, it can be compared nationally and internationally with northern states and Canada. The survey can be used to study trends found in northern North America.

**Goals of the Owl Monitoring Project:**

U.S. Army Alaska wildlife goals, in cooperation with the U.S. Fish and Wildlife Service and Alaska Department of Fish and Game, are to maintain stable, sustainable wildlife populations on the 1.6 million acres of land under its management.

The main goal of this project is to develop a standardized protocol for monitoring owl populations in the Tanana Flats Training Area, Yukon Training Area, Donnelly Training Area and main post areas beginning in 2005.

Additional goals of this project are to:

1) Understand the distribution and abundance of owl species in the region.

2) Estimate trends in the relative abundance of owls in the area.
3) Study seasonal changes in call rates, distribution, and abundance throughout the late fall, winter, and early spring seasons.
4) Estimate habitat associations of owl species in the region.

**Methods**

The study requires the implementation of a standardized owl survey designed to collect data throughout the winter season along a designated trail. The following protocol have been applied nationwide and have been modified slightly for the Tanana Flats Training Area, Yukon Training Area and Donnelly Training Area.

**Route distance and listening period:**

- Each survey route consists of 10 survey stations spaced 1 mile (~1.6 km) apart.
- An eight-minute "passive" listening period is conducted at each designated survey point along the route. After the observer exits the vehicle, he/she should wait a minute or so before starting the eight-minute listening period. This will allow the engine to "quiet" down. The observer will document number of calls during 0-3, 3-5, and 5-8 minute periods. The observer will also record the number of calls heard per individual bird for each interval.

### Distance and compass heading information:

Distances from observer to calling owls is estimated as well as compass bearings on call directions. Data recorded is used to examine species detection distances, identify ecological unit owls are calling from, and minimize double counting of individual birds. The estimated distance to the owl, the compass direction of the call from the observer, and the observer's geographical location will be plotted in ARCVIEW to determine owl locations.

### Atmospheric information:

Moon phase and visibility, wind speed, cloud cover, and precipitation conditions are recorded at each survey point as well as Global Positioning System locations and the ecological unit at each point.

### Survey times and projected length of route:

Owl surveys beginning one half hour after sunset should be completed within 4-5 hours. Sunset/sunrise times for the Fairbanks area can be determined from the Flight Service information network in Fairbanks, AK.

**Data to be recorded:**

At the start of each route, the route number and name, time, temperature, moon phase and visibility, cloud cover, precipitation level and type, wind speed, and snow cover and depth will be recorded on a data sheet, which is provided.

Wind speed and noise level will be recorded on the data sheet at each station along the route. A wind speed table and description of noise levels is provided.

### SB4.1.4 Mew Gulls

Mew gulls (*Larus canus*) return to the Fort Wainwright area to nest each spring. The gulls prefer isolated or stationary platforms upon which to build and protect their nests. Islands, long-term storage containers and stationary vehicles are consistently used on post. A large segment of military motor pool areas are found on the east side of Badger Pond, an active gravel pit. Although a %age of birds nest on the two small islands within the pond, some tend to move into the motor pool areas and attempt to build nests on the roofs or hoods of Humvees, Small units support vehicles, Strykers, and other military vehicles. Once eggs have been laid, vehicles must remain inactive, by law (Migratory Bird Treaty Act), until the chicks are fledged.

The Natural Resource Office currently advises all military units to monitor their motor pools daily during spring migration; and to remove nests while they are being built. We have also directed that once eggs are found in the nest, the affected vehicle must remain inactive until the birds have left the nest. Inactive vehicles results in loss of training opportunity for Solders.

Prior to 9/11, Fort Wainwright soldiers rarely deployed to combat situations. Post 9/11, military vehicles are required year-round for military training, and deployment. Annually, since 1997, at least one call has been received from personnel regarding active nests on their vehicles. Natural Resources personnel have applied for and obtained annual sanctions from the U.S Fish and Wildlife Service to approve permit authorized personnel within the Directorate of Public Works to relocate bird nests from vehicles using plywood or other flat items. By sliding the object under the nest, it may be moved to the most isolated area of the motor pool and left undisturbed. Up to 10 nests in a given year are permitted relocation. A nuisance gull management plan will be required by U.S. Fish and Wildlife Service starting in 2007 for continued application and permitting for depredation sanctions. Nesting control and monitoring activities are now required as part of that management plan. Observation measures were begun in 2005 and are now standard operations that occur on the Main Post of Fort Wainwright, mostly in the motor pools near Badger Pond 64˚49'N, 147˚ 36'W. Daily records are compiled by the Natural Resources Coordinator at the Environmental Resources Office, 3023 Engineer Road, Fort Wainwright, Alaska.

Fort Wainwright obtained gull depredation permits from U.S. Fish and Wildlife Service in 2004 and 2005. Previous permits were most likely obtained; however, records are currently unavailable/unknown. The purpose of this permit is to allow for the removal of occupied nests that have been established on active military equipment or vehicles. The gulls find unmoving vehicles and equipment premier nesting habitat as it is elevated aboveground level and defendable from most predators. The parking areas next to Badger Pond are also considered prime habitat, as they provide an isolated, safe place for chicks to gather prior to flight capability. When monitored properly, nest building can be deterred and equipment kept free of hindrance. On occasion, a nest might accidentally be overlooked during the monitoring and need removing. However, the priority is for preventative measures and that is where the survey serves best.

Daily surveys were initiated in 2005 to monitor mew gull nesting activities in and around historically hit motor pool areas. The purpose of monitoring was to establish timelines for nesting activity and obtain detailed information on nest removal and relocation.

In 2005, a major deployment of troops and equipment took place and on many occasions the areas to be surveyed were inaccessible. Nest and contents could not be counted properly and therefore the 2005 survey is lean on the nest activity details. Gull nest surveys were the only form of monitoring conducted during 2005. Nests were not removed during nest building and active phase. However, some nests were removed after chicks had left. Accessibility was a major issue preventing nest removal, and active nest removal was hampered by the delay of the depredation permit. Fortunately, many vehicles and necessary equipment were already removed from the parking areas and gull nesting did not hamper military operations.

Troops and equipment are now returning to Fort Wainwright, and proactive monitoring activities will prevent unnecessary vehicle downtime. Part of the management plan will now include annual submittal of educational material along with contact information to commanding officers in charge of motor pools in March. A second reminder of the upcoming nesting season will be issued in April.

Daily monitoring will begin with first observations of gulls on main post, and continue until all nesting behavior ends for the season. Monitoring will be shared by natural resource/environmental and motor pool military personnel. Access to motorcade parking areas will be arranged and allowed for affective nest monitoring by nonmilitary personnel. A combined lock system with natural resource/environmental seasonal accessibility during the breeding season will greatly increase nest search ability, and allow for newly constructed and inactive nests to be removed in a timely manner. If access is unobtainable, and an active nest is found thereafter, the commanding officer or motor pool manager will notify the Natural Resource Office of nesting activity, and if able, the nest will be relocated. If unable, the vehicle will be unusable until the nesting behavior is completed.

Current monitoring surveys occur at the following buildings: 2295, 3015, 3421, 3425, 3475, 3477, 3479, 3480, 3485, 3490, 3492, 3494, and 3496. Surveys consist of daily walk-throughs, in which personnel document any and all nesting activity. Incomplete or unoccupied nests will be removed daily and documented. Empty nests, devoid of chicks and or eggs are defined as unoccupied. A nest is defined as occupied once an egg has been placed into the structure, and therefore only permitted personnel may remove or relocate the nest. Only ten nests may be removed or relocated during the season. Activity documented includes nest building, completion, and presence/number and location of eggs and chicks. Data is collected and assembled in an excel spreadsheet.

Annual submittal of the required monitoring surveys, and annual reports to U.S. Fish and Wildlife Service, Alaska Department of Fish and Game, and U.S. Department of Agriculture/Animal and Plant Health Inspection Service will be conducted when breeding season is over, and personnel will begin application for new permits and required forms from all agencies before November each year, unless otherwise indicated by said agencies. Timely permitting will greatly increase the effectiveness of judicious nest removal from needed equipment and buildings if nest construction is missed.

The management plan will continue and be regularly updated as long as gulls remain an issue at Fort Wainwright, and depredation permits are required. Proactive activities will insure optimum training opportunities for military personnel as well as compliance to federal law.

## SB4.2 Bear Survey

Brown bear (*Ursus arctos*) will be studied to determine numbers, diet, and habitat use and movement patterns across the greater Anchorage-Eagle River area including Fort Richardson and Elmendorf Air Force Base military lands.

<u>Methodology</u>. Beginning in April 2005, upon den emergence in the spring biologists with Alaska Department of Fish and Game, Fort Richardson Natural Resources Department and Elmendorf Air Force Base will capture up to 10 adult female brown bears and deploy radio collars with Global Positioning System remote download capabilities.

Bears will be captured either by helicopter darting, ground trapping, or free-range darting. All captures will be conducted according to the Alaska Department of Fish and Game animal care and use policies. Collared bears will be monitored periodically by aerial radio telemetry utilizing the VHF transmitter of the radio collars. Additional bears may be captured opportunistically during the summer as natural resources managers deal with problem bears.

The Global Positioning System collars will collect bear location data approximately every ninety minutes and all data will be retained in collar memory. Bears will be located by aerial radio telemetry approximately every two weeks, and archived Global Positioning System data stored in the collar will be uploaded to the aircraft. The Global Positioning System collars will be programmed to collect data for two summers. All collars will be removed at the end of the study unless Alaska Department of Fish and Game (ADF&G) priorities require the maintenance of the collars on individual bears.

Habitat use and movement patterns: ADF&G personnel will perform all data entry and statistical analysis related to this project. Bear locations will be entered into an ArcGIS 9 database. Location data will be compared with habitat types using multivariate statistics to identify areas used by bears. Relevant Geographic Information System databases will be collected from ADF&G and Fort Richardson Environmental Geographic Information System Section. Bear movement data will be examined to determine the existence and location of travel corridors on Fort Richardson, Elmendorf Air Force Base and across the greater Anchorage-Eagle river area.

Brown bear numbers: Biological samples (hair, blood, and scat) will be collected from all captured bears and from bears killed by hunters, vehicles or in defense of life or property in the study area. Additional hair and scat samples will be collected by Fort Richardson Natural Resources Department staff during weekly visits to transects established in suitable bear habitat identified by Fort Richardson Natural Resources Department biologists. DNA will be extracted from all blood and hair samples. Microsatellite and mitochondrial laboratory analysis will be conducted by ADF&G personnel in their lab, and species identification, gender, and possibly individual identification to un-collared bears will be assigned.

Brown bear diet: Hair and blood samples will be analyzed for stable isotope concentrations of carbon, nitrogen, and sulfur to provide information on bear diet. Samples will be prepared in the ADF&G lab in Anchorage, and the isotopic analysis will be performed in the U.S. Geological Survey stable isotope lab in Denver, Colorado.

## SB4.3 Bison, Caribou, and Moose Monitoring

### SB4.3.1 Fort Richardson Aerial Winter Moose Surveys

Aerial surveys of the moose population living in and around Fort Richardson have been conducted for approximately 40 years (comprehensive data available from 80s to present) and are currently conducted jointly by the U.S. Army and ADF&G. These annual comprehensive surveys are usually flown during early winter when obscuring deciduous foliage is at a minimum and when there is sufficient fresh snow depth (approximately 1-2 feet) to cover dark vegetation and soil that would otherwise mask the presence of individual moose. Every attempt is made to complete the surveys prior to the middle of January to minimize sexing errors due to the annual antler shed and to allow antler-class data collection. Data analysis and report generation are conducted by ADF&G. Data from these surveys are used in a variety of management decisions.

The area covered by this survey includes Fort Richardson, Elmendorf Air Force Base and upper Ship Creek Valley for a total coverage area of approximately 90,000 acres. This total area is divided into 14 discrete units of land called Survey Units. Contained within each survey unit is a smaller area of land called an intensive plot. Survey unit and intensive plot boundaries remain the same from year to year and follow recognizable topographic features to the greatest practicable extent. The size of each survey unit varies depending on area topography and range from just over 4,100 (survey unit 13) to just over 9,500 acres (survey unit 5). Intensive plot sizes likewise vary and range from just under 450 acres (intensive plot 8) to just under 900 acres (intensive plot 2).

Surveys typically employ the services of two experienced contract pilots flying small, maneuverable aircraft with low stall speeds (e.g., PA-18, Piper Supercub). Total survey time varies depending on a variety of factors but usually requires 18 hours (1 -2 hours per survey unit) combined flight time flown over the course of two consecutive days.

Data are collected by a single trained observer in each plane (typically one Army and one ADF&G) and are recorded on a standard data form (see “Moose Census Form”). Data recorded per animal observed includes sex, relative antler class (if bull), number of calves (if cow) and if located in the intensive plot (called sightability corrector factor in the data sheet). Also indicated per survey unit are start/stop times, temperature, snow age and cover, light type and intensity, predominant habitat type and conditions potentially affecting the survey results.

Surveys are conducted around 800 feet aboveground level at an approximate airspeed of 60-70 m.p.h. Each survey unit is flown in its entirety using a standard linear search pattern and then each intensive plot is resurveyed using a more intensive circular search pattern. The standard search consists of consecutive parallel transects (modified as required by topography and survey conditions) covering the entire survey unit (including the intensive plot). Transect width varies from approximately .25 -.5 mile. Every moose observed along the focus transect is circled to ensure data integrity.

The standard search portion of the survey provides data on the number of animals actually observed in the survey unit as a whole but must be adjusted for animals not seen by the observer to obtain a more accurate picture of population size. This adjustment is accomplished, in part, by intensively resurveying a portion of the survey unit (i.e., the intensive plot) using an overlapping circular flight pattern. The objective of this intensive search is to obtain an exact count of the number of animals contained within each intensive plot.

These data are then compared to the number of moose observed in the intensive plot during the standard search and are used by ADF&G to generate a Sightability Correction Factor for that survey. This Sightability Correction Factor is a multiplier that is then used to adjust the observed number of moose to account for animals that were missed during that particular survey. For example, suppose that 8 moose were observed within the intensive plot during the standard search of a given survey unit and that 9 were actually sighted during the intensive search of the intensive plot. Assuming that every animal within that intensive plot was counted during the intensive survey and that the intensive plot is representative of the entire survey unit, it is assumed that for every 8 animals observed in the standard search, one animal was missed (.125 animals were missed for every animal sighted or 12.5% of observed total were missed). To adjust the number of observed animals then, the total number of observed moose is multiplied by 1.125 (Sightability Correction Factor).

### SB4.3.2 Caribou Surveys

Caribou known to utilize the Donnelly Training Area include the Delta and Macomb herds. The Delta caribou herd primarily occupies an area in the northern foothills of the central Alaska Range between the Delta and Nenana rivers. During the mid- 1980s, calving areas were primarily located between the Delta and Little Delta rivers. However, as the herd size increased during the mid 1980s, calving began to extend into the Dry Creek area, and, by 1993, they were reported as using the upper Wood River, Dick Creek, upper Wells Creek, and upper Nenana and Susitna drainages (Valkenburg et al. 2002; Valkenberg et al. 1988). According to ADF&G, the majority of calving in recent years has been in the upper Susitna and upper Yanert drainages. Some calving has also occurred on the north side of the Alaska Range between the Little Delta and Tatlanika rivers. A few Delta caribou do calve on military lands east of the Little Delta each year (Mark Keech, personal communication). The Delta caribou calving area is delineated in the 2002-2006 Fort Greely and Donnelly Training Area, Alaska Integrated Natural Resources

Management Plan. During the fall and winter of 2000, ADF&G noted a significant portion of Delta caribou herd located on Donnelly Dome and Donnelly Flats area.

The Macomb caribou herd utilizes the mountains of the eastern Alaska Range, from the Delta River to the Mentasta Highway, concentrating activity between the Robertson River and Jarvis Creek. ADF&G reports that the Macomb caribou herd also utilizes the Tanana River valley lowland for forage during the winter season. Primary calving grounds for the Macomb caribou herd are located on the Macomb plateau. The history and management regarding both the Delta and Macomb caribou herds can be found in the ADF&G 2003 management report (ADF&G 2003).

Numerous survey studies concerning the Delta and Macomb caribou herds have been conducted over the years (Young 2001 & 2004; Dubois 2001; Froehle 1982). A 1979 cooperative project led by ADF&G and supported by USAG-AK, surveyed calving caribou in a 90 mile$^2$ area during a five-day period in May. The area examined lay between Delta Creek and Delta River on the southern boundary of Donnelly Training Area (ADF&G 1980). Alaska Biological Research, Inc. and University of Alaska Fairbanks performed noise sensitivity studies on Delta herd animals subjected to over-flights during Air Force training activities on the west side of the Delta River (Maier et al. 1998). ADF&G routinely tracks and monitors collared animals for both the Delta and Macomb herds.

During the late 1990s and early 2000s, it was noted that caribou had begun to use Donnelly Training Area East (in the vicinity of Donnelly Dome and Donnelly Flats). Proposals for military development in this area spurred natural resource staff interest in possible conflicts with caribou and/or caribou habitat. During the time, resource managers did not know the degree of caribou use of Donnelly Training Area East, when activity occurred, or to which herd animals belonged. Both the Macomb and Delta herds' ranges overlap on Donnelly Training Area East, and both herds have unique management strategies as put forth by ADF&G. Prior to February 2004, no specific survey concentrated on caribou use for the Eddy Drop Zone, Donnelly Drop Zone, and Texas Range areas. The decision was made to establish aerial surveys specifically designed to study caribou presence in and use of Donnelly Training Area as a whole for management assessment and development purposes.

Survey flights were set up once a month, year-round, weather dependant. Each survey was flown in an Aviat Husky A-1 carrying the pilot/biologist and biologist/observer (both in-house staff of the Environmental Office of U.S. Army Garrison Alaska). Applying a survey study design based on input from ADF&G Delta Junction and Fairbanks area biologists, the survey began by flying roughly 8,000 ft. mean sea level along the Donnelly Training Area boundary, detecting and documenting radio collar frequencies. While flying the boundary, detected frequencies would be documented, if possible, as being located on or off Donnelly Training Area. All collars delineated as being within the installation boundary as well as any large concentration of animals near the border were tracked, and located at low-level for the purposes of obtaining collar number verification, herd size estimate, latitude/longitude position, and notes were taken pertaining to herd movement, calving, feeding, habitat use and any other pertinent information with regard to herd activity.

An intense low-level survey for Donnelly Training Area East was initially set up using east/west transects 30" apart starting about (63˚ 54' 00") flying south, and ending roughly at (63˚ 47' 00"). The western boundary extended roughly between the Delta River and Windy Ridge. Altitude varied depending on terrain. If caribou were located, the pilot would break from the transect line and circle, counting the number of adults and calves, if seen, mark the individuals using the onboard Global Positioning System unit and document number of individuals and activity. Once the information was collected, the pilot would resume flying the transect line. The transect surveys were put aside later on for lack of productivity and sightability issues, and, instead, the pilot and observer would spend the majority of time locating collared animals after the initial high level survey had been conducted. Data was entered into an excel spreadsheet and coordinates were layered onto a map for visual reference.

A total of 13 surveys were flown between February 2004 and March 2005, before the tragic loss of the pilot Tony Payne. Primarily, animals were initially located by tracking collar frequencies, and visually identified, when possible, by collar number. Collar frequencies have been omitted from the report and instead collar numbers are used for identification purposes. Some caribou have identical collar frequencies, or numbers and sometimes both. Non-collared animals were detected by transect work and opportunistically.

### SB4.3.3 Bison Surveys

The Delta Bison Herd is located in the Delta Junction/Donnelly Training Area, and has been the subject of interest for the citizens of Delta, the Alaska Department of Fish and Game, the Delta Agricultural Project and the U.S. Army Garrison Alaska (USAG-AK). The bison migrate between private, state and federal lands, which affects special management decisions due to very different needs and goals. In gathering documentation and data for this report, it became apparent that the Delta bison herd has a long and convoluted history and that it was important to provide an account of activities to best understand the topic as a whole when discussing current USAG-AK activities and possible recommendations. The purpose of this document is threefold. The first is to provide a brief but encompassing history of the Delta bison herd. The second, to present USAG-AK qualitative survey data on the movements and distribution of the bison during calving season. Finally, to offer recommendations that may contribute to the cooperative management of the bison herd.

Survey flights were set up once a week, weather dependant. The survey was flown, between 200’ – 500’ above ground level, in an Aviat Husky A-1 starting from Delta Junction and beginning at the mouth of Jarvis Creek. It was considered highly unlikely that there would be any bison north of this point (Steve Dubois, personal communication). From there, an intense survey was begun, flying the Delta River bank to bank, until reaching the Keyhole boundary, where the plane was flown as far east as Windy Ridge, including Texas and Washington ranges. The pilot resumed bank-to-bank flying after reaching the spruce forests located at the southern boundary of Washington Range. During 2005, the survey was flown between the Delta River and the eastern boundary of Donnelly Training Area, checking for bison still migrating to the summer range. The survey was flown using east/west transects 1/2 mile apart to a point south of Buffalo Dome. From Buffalo Dome, the pilot flew south down the west bank of the Delta River, also covering forested areas. The census was continued down to the outlet of Black Rapids Glacier. If a herd was located, the pilot would break from the transect line and circle, counting the number of adults and calves, if seen, and recording Global Positioning System coordinates. Once the information was collected, the pilot would resume flying the transect line. Each survey took approximately 3.5 hours.

Collected data was entered into an excel spreadsheet, and coordinates were layered onto a map for visual reference. % of the bison herd observed was calculated from the total number of animals counted during each survey and the management goal population of 360 as put forth by Alaska Department of Fish and Game.

## SB4.4 Small Mammal and Furbearer Surveys

### SB4.4.1 Small Mammal Surveys

The primary objective of this survey is to conduct an inventory of small mammal species.

The contractor shall (1) develop a sampling plan that inventories riparian and other critical habitats under-represented in the 1994 survey, as well as habitats thought to harbor rare species, (2) execute the sampling plan and collect the field data, and (3) collect representative voucher specimens for all species encountered.

Task 1. Develop a sampling plan

The contractor shall develop a sampling plan to inventory riparian and other critical habitats under-represented in the 1994 survey, as well as habitats thought to harbor rare species. The sampling plan will be based on the habitats represented on the existing vegetation map. This map lists vegetation types to the level IV of Viereck et al. (1992).

Task 2. Trap small mammals

The contractor shall navigate to the selected sample sites and trap small mammals at each site following standard methods for mammal trapping in Alaska (using Sherman live traps, museum specials, rat traps, and pitfall traps). As much as possible, the methods and trapping effort will be held constant among sampling sites.

Task 3. Collect and maintain voucher specimens

The contractor shall collect and maintain voucher specimens and blood samples of each species for potential genetic analysis, epidemiological studies, and toxin indicators. U.S. Army Alaska will not, however, pay for these analyses.

The contractor shall deliver a draft report in standard scientific format that includes introduction, methods, results, and discussion. The report will describe in detail the actual locations of the sampling sites (field Global Positioning System coordinates and a map of the sites), the effort spent in trapping at each site, the small mammal species identified (by site), a description of small mammal/habitat associations, and management and/or inventory recommendations for small mammals.

Army personnel have conducted small mammal inventories, using a combination of live (Sherman live traps and pitfall) and museum special snap traps, on a small portion of Army land with more inventory work needed during the 2007-2001 time frame.

Areas to be sampled are determined by natural resources personnel in coordination with Range Control, with plot numbers and locations within each area chosen based on a variety of factors.

Each plot is sampled for three nights, with traps checked every 24 hours. Each plot consists of 120 traps set along two 300 meter linear transects that are roughly parallel (depending on topography) and 30 meters apart. Each transect consists of 20 stations set 15 meters apart. Each station consists of a circular array (about one meter apart) of three traps: one museum special snap trap, one Sherman live trap and one conical pitfall trap. Snap traps are baited with a mixture of rolled oats and peanut butter, and Sherman live traps are typically baited with raisins and de-shelled sunflower seeds. Pitfall traps are not baited. Trap placement within the specific circular configuration varies but are usually set along natural runways when possible.

All easily identifiable live specimens captured are placed in a plastic bag to protect both the animal and collector, measured and then released immediately on-site. Live specimens that cannot be positively identified in the field are euthanized quickly using cervical dislocation per Colorado State University animal handling procedures.

Specimens are placed in individual plastic bags along with a waterproof label noting specimen number, date, location, species, condition of specimen and collector (s). The specimens are then placed in an iced cooler within one hour of collection and frozen within 3 hours in order to maintain high quality tissue samples for possible future studies.

All specimens, except for those identified in the field and released, are sent to the museum at the University of Alaska Fairbanks for curation. Specimens are cleaned, processed, identified and preserved in the University of Alaska Museum Mammal Collection. Ecto and internal parasites are collected for future studies. Tissue samples from most specimens are collected and immediately frozen in an ultra-low temperature freezer (-80 C). All data are entered into the Museum database and USAG-AK databases

### SB4.4.2 Bat Surveys

Methodology. Acoustic monitoring will be the primary means utilized to sample bat community presence, composition, relative abundance and activity levels. Mist netting surveys will be used to capture bats to verify species identification, for species specific data collection and to record reference calls. Field surveys will be conducted during periods of frequent bat activity (approximately 1 June - 1 October).

Acoustic monitoring. Bat echolocation calls will be monitored and recorded using ultrasonic bat detectors (Anabat II® or Petterson D240x) in conjunction with an electronic Interface Module unit and laptop computer or remotely using ultrasonic bat detectors in conjunction with sound activated cassette tape recorders. Remote detector units will be housed in black PVC boxes and strapped to trees 3-4 meters above the ground with the microphone of the detector directed at a 45-degree angle from the ground. An IBM compatible computer and Anabat6 or Sonobat software will be used to create, display, compare and analyze sonograms (Time vs. Frequency) of recorded bat echolocation calls. For the purpose of data analysis, a call sequence will be defined as a series of bat calls with duration of greater than 0.5 ms consisting of more than two individual echolocation calls. Calls recorded in the field will be compared to calls of known identity or “reference calls,” allowing genus specific features of bat echolocation calls to be discriminated and, in some cases, species specific differentiations will be made.

Mist net surveys. Mist net surveys will be conducted by qualified USAG-AK natural resources staff in accordance with Alaska Department of Fish and Game permit requirements. Because mist net surveys for bats are more successful over water sources such as ponds and streams where bats forage and drink, mist netting surveys will focus on the water sources within the survey area that appear most conducive for capturing bats. Avinet® 9m and 12m length nets and Avinet® 3 piece net pole sets or equivalents will be used. Three nets, with spacing of approximately 30 meters as determined by site logistics, will be opened at sunset and kept open for three hours or until at least one hour passes without a bat capture. Nets will be arranged to maximize capture success and will be centered on the best available foraging habitats in the survey site area. Mist nets will not be deployed on nights with inclement weather such as low temperature or precipitation. Captured bats will be removed from mist nets, placed in 100% cotton drawstring bags and transported to a central area located 20-40 meters from the nets for processing. Species-specific identification will be determined using published dichotomous keys. For each captured bat the species, sex, reproductive status, mass, forearm length, age class, capture time, net number, direction of flight and air temperature at time of capture and will recorded. Juveniles will be distinguished from adults by a lack of ossification of the third metacarpal-phalangeal joint. To further discriminate between *Myotis* species, additional data will be taken such as tragus length, thumb length, right rear foot measurements, as well as calcar keel and fringe presence. Every effort was made to ensure the welfare of captured bats and to prevent individuals from escaping the nets. To monitor the presence of insects available as potential prey for bats during the mist net survey periods, insect traps constructed of four inch (10.16 centimeter) diameter black ABS tubing smeared with axle grease will be deployed at acoustic survey sites. Traps will be suspended 1-2 meters above ground level. All captured insects will be removed from traps, stored in alcohol and later identified to Family level using published dichotomous keys.

Additional Data Collection. The following information will be obtained and annotated on a bat survey data form:

a. Date: dd/mmm/yyyy format, e.g., 10 Jul 2005.
b. Observer: names and initials of all survey personnel present.
c. Station: Survey site location.
d. Global Positioning System data: Global Positioning System coordinates of survey site locations.
e. Time: 24 hour time. Start and end times of survey periods.

## SB4.5 Fisheries Surveys

### SB4.5.1 Pike Surveys

Northern pike have been confirmed in two lakes, Otter and Gwen, on Fort Richardson although Gwen Lake experiences heavy winter die-off and is currently not thought to harbor pike. Pike are not indigenous to south-central Alaska and can have devastating effects on ecosystems that have not adapted to their presence. Indigenous forage fish and visiting wildlife (waterfowl, small mammals, etc) are likely to suffer from the highly predatory pike. Additionally, stocked rainbow trout in these lakes are likely to be highly impacted. The primary objectives for this project are to monitor for the presence/absence of pike in post lakes and to remove as many pike as possible from water bodies harboring pike. The secondary objective is to delineate potential prime pike spawning and rearing locations in all post water bodies.

Monitoring for the presence of pike in Fort Richardson waters consists of review of annual Alaska Department of Fish and Game fish harvest reports, angler interviews and visual surveys of the water bodies themselves. Fish harvest reports are reviewed annually for records of pike harvest in Otter, Clunie and Gwen lakes (records from 1979-2004 indicate no reported pike harvests). Anglers are interviewed in the field as often as possible throughout the year and are queried for pike observations or harvest.

Visual surveys for the presence of pike in Fort Richardson lakes (Otter, Gwen, Thompson, Walden, Clunie) is conducted by Army personnel on an annual basis. Personnel circumnavigate each post lake by non-motorized boat or canoe at least once during the summer, searching for observable pike. Observers are equipped with polarized sunglasses for enhanced subsurface visual acuity and gps units to record exact locations of observations. Survey areas and patterns vary depending on the water body but in general are concentrated along the shoreline and around offshore patches of aquatic vegetation. In areas where shoreline vegetation makes visual detection of hiding pike difficult, personnel may employ electrofishing techniques if doing so can be accomplished safely and with a reasonable degree of certainty that non-target species will remain unaffected by the electrical pulses. Areas of likely spawning and rearing habitat are also noted during the water body surveys and are mapped to aid future monitoring and removal efforts.

### SB4.5.2 Fisheries Harvest Surveys

Army personnel monitor fish harvest in installation waters primarily through review of annual Alaska Department of Fish and Game fish harvest reports and secondarily through on-site angler interviews. Data available from Alaska Department of Fish and Game fish harvest reports includes (for select water bodies) number of anglers, trips, days fished and number of harvested fish per species.

Additionally, anglers are interviewed in the field as often as possible throughout the year and are queried regarding harvest success.

### SB4.5.3 Spawning Salmon Surveys

Chester Creek Adult Coho Survey
Army personnel conduct annual streamside surveys of adult coho salmon in South Fork Chester Creek on Fort Richardson to determine timing and abundance of spawning coho in addition to delineation of important spawning areas along the stream. Streamside salmon surveys are often conducted in tandem with the collection of brown bear hair for the brown bear population estimation component of the brown bear telemetry project. Data generated from this survey is used for a variety of management decisions and may serve as baseline data in support of salmon reintroduction efforts on Chester Creek.

Surveys are typically conducted weekly in August and September. The surveys employ a minimum of two observers, both equipped with wading equipment, polarized sunglasses and gps units. Surveys start at the bridge on Bulldog Trail and proceed both upstream and downstream for a distance of approximately 100 yards past the last observed adult salmon. Both upstream and downstream stretches of the creek are surveyed during the course of a single day when possible to minimize duplicate counts resulting from fish movement.

Observers proceed carefully along one bank of the creek with the lead observer scanning primarily for salmon and the trailing observer recording data and scanning primarily for bears. Data recorded include date, survey conditions, species, numbers and location of all fish observed. Also recorded are observations of bear activity. Every attempt is made to minimize disturbance to fish.

Campbell Creek Adult Salmon Survey
Army personnel conduct annual streamside surveys along North Fork Campbell Creek on Fort Richardson to determine timing and abundance of spawning sockeye, coho and chinook salmon in addition to delineation of important spawning areas along the stream. Surveys start at the footbridge on Bulldog Trail and proceed upstream for approximately 100 yards past the last observed salmon and downstream to the installation boundary.

Survey methodology follows that given above except that they are conducted weekly from June until October.

## SB4.6 Beluga Whale Monitoring

***Schedule for Observations:***
Observations will be conducted on as many days as possible during the months of May-November. Technicians assigned to the beluga project will be prepared to conduct observations every work day and some weekends. Before the observation season at the mouth of Eagle River can begin, a trail must be cleared by Explosives Ordnance Demolition (EOD) personnel. Alternate trails will also be established leading from the main trail around the ends of tidal channels, to allow for egress during average high tide events (28-30 feet). Anyone accessing the mouth across the flats must have the appropriate training (see below), coordinate with Range Control, retain positive radio communication with Range throughout the entirety of the stay on the ERF and must walk only on the trail cleared and marked by EOD.

Observation start times will be as close to 0800 as possible with end times around 1600. These are loose guidelines however, as ambient light (especially in the fall) and tidal state conditions (high tides often cover the routes cleared by EOD and thus preclude entrance into the impact area) will often dictate the true start time. Also, there may be times when tidal conditions will preclude leaving the flats until well after 1600.

Observations will be coordinated as far in advance as possible with Range Control, noting, however, that the Range schedule usually does not extend beyond a couple of days to a week at the maximum. The number of days in which sampling can occur in ERF is directly related to military training activities. Any military training involving "live fire" exercises may block use of access roads used to enter ERF if they are within the firing fan of the training at hand. The firing fan is that area in which there is a one in a million chance of a live round of ammunition landing outside of the surface danger zone. The amount of data that can be collected over the course of the field season is therefore directly related to these activities. Currently, no firing is taking place during the field season.

***Training:***
All field observers will attend the following safety courses: First aid/CPR (unless possessing current certification), Unexploded Ordnance training, Eagle River Flats safety briefing and bear safety. All field observers will read, at a minimum, section I of the National Marine Fisheries Service document, "Conservation Plan for the Cook Inlet Beluga Whale *(Delphinapterus leucas*), 2008" http://www.fakr.noaa.gov/protectedresources/whales/beluga/mmpa/final/cp2008.pdf .

Field observers will also undergo supervised training by experienced (minimum of two years of directed beluga observations) permanent staff regarding data collection procedures and identifying defined whale behaviors. Observers will be exposed to the full variety of typical behaviors exhibited by beluga whales in Eagle River and Eagle Bay. A minimum of 40 hours of supervised training will take place before observers will be allowed to collect data on their own. Most of the time, at least one experienced member of the permanent staff will be present throughout the field season. A minimum of two observers will always be present during whale observations.

***Observations and Data Collection:***

**Follow protocol:** Group follow
**Sampling Method:** Focal group sampling.
**Length of Sampling Round:** 20 minutes
**Parameter of Interest:** Beluga abundance (# of individuals or # of whale groups).
**Estimator:** mean number of belugas, mean number of whale groups

Once at the observation point, one observer will scan for belugas in Eagle Bay using high quality binoculars (Zeiss and Swarovski 12x45) and spotting scope (Swarovski 20-60X)[1] while the other observer scans the river using the naked eye. Scans will be broken down into 20 minute sampling rounds. Once whales are spotted, observers will follow a single group of whales for 20 minutes or until the group can no longer be seen due to distance or environmental conditions.

All observations will be noted on a standardized data sheet. The observer will define group activity based on their assessment of what most (>50%) of the whale group is engaged in during the course of the sampling round. Up to two behaviors can be recorded during the sampling round, with one being designated as the primary ($1^o$) activity and the other designated as the secondary ($2^o$) activity. Any unusual behaviors during sampling rounds will be noted in the comments section on the back of the datasheet.

[1] Inclusion of specific company names or products in this document does not indicate endorsement by the U.S. Army or any other entity named herein.

Behavioral budgets of belugas (a proportion, calculated as time spent in a behavioral state/total time focal group follow) will be calculated. Budgets can also be determined on a daily scale, at 1-hour intervals over the course of the day (average proportion of time spent per behavioral state per 1-hour interval). Beluga behavioral budgets will allow us to examine the range of activities whales engage in over the course of the day in a systematic fashion and whether or not these behaviors change over the course of the field season. Focal group sampling is subject to several biases such as attention being drawn to more obvious behaviors and differential visibility of group members due to their activity (Mann 2000), but there are a few reasons why this sampling methodology is being used in ERF. First, focal animal sampling for belugas is not possible as individuals are very hard to identify and following them at any distance in the turbid conditions of Eagle Bay and Eagle River is not practical. Second, two years of whale observation from ERF has shown that belugas tend to move as one cohesive group into and out of the observation area over the course of the day, with relatively small inter-individual distances, which lends itself very well to group sampling. In addition, because of this cohesive behavior, rare behavioral events can be recorded without losing track of the primary behavior of the group itself.

Over the course of each sampling round counts of whales will be made, distinguishing between white, gray, and calves. *Only whales actually seen will be counted. There will be no attempt to account for whales that might be under water***.** These estimates will be averaged to come up with an estimate of the total number of whales observed over the course of the day. Since most observations over the course of a day are of the same group of whales, the number of animals observed will usually increase as the whales move closer to the observation point, allowing for more accurate counts. Summary statistics will be calculated for the mean number of whales observed for each day, week and month. Single factor analysis of variance will be used to determine if there are significant differences in the mean number of belugas observed in and around ERF from month to month (May-October) and over the course of the day. Sample size requirements needed to obtain a 95% confidence interval for multisample means analysis will follow Zar (1984).

Environmental conditions can mask the true color of an individual. Under some lighting conditions for instance, some gray animals appear much lighter than they actually are. For this reason, observers should, to the greatest extent possible, compare the size of gray animals to that of associated white animals. Additionally, while beluga calves are primarily dark in color, calves ranging from pinkish-brown to almost pure white have been observed in Knik Arm. Since observed whale groups tend to move closer to the observation point throughout the day as they move up Eagle Bay, more accurate enumeration of age class composition will be possible, helping to minimize observation biases associated with distance. Furthermore, based on past observations, the ability to count and classify whales decreases dramatically on the west (far) side of Eagle Bay sandbar. Because of this, enumeration and classification of whales will only be recorded for animals sighted on the east (near) side of the sand bar, which should further help to minimize distance bias. Environmental conditions will be recorded at the start of every sampling round. Any sampling round in which conditions are rated as poor will be truncated from the data set and excluded from analysis.

An alpha-numeric grid superimposed over a map of the area will be used to record the location of a whale group at the start and end of the sampling round. A compass bearing to the whale(s) position relative to the observation site should also be noted to help refine the location. Depending upon funding, a theodolite may be purchased in order to more accurately denote whale locations.

The time covered by each sampling round will be noted (in 24 hr. mode). This will allow for further analysis of whale numbers over the course of the day. Unusual behaviors or other species of wildlife observed will be recorded in the notes section. Any signs of a beluga in distress (signs of entanglement, strandings, etc) will be reported immediately to the NMFS [(907)360-3481)]. Any harassment of belugas by boats must be reported to NMFS enforcement division [( 907) 250-5188]. Pictures (especially video) of such incidents and recording of boat numbers and detailed descriptions will be taken to aid in carcass recovery, rescue, or law enforcement efforts. Responses (if any) of belugas to boats or aircraft flying over the study area should also be noted. The presence of other marine mammals (such as harbor seals) should always be recorded in the notes section as well.

*Observers will only follow one group at a time per sampling round*. If a group can no longer be observed, then it is permissible for the observer to move on to another group, making sure to note the sampling round and whale count in the next row on the data sheet. Each whale group will be given its own unique sampling round number to distinguish between separate samples. Separate data sheets will be used for each distinct whale group. If more than one group is present at the same time, more than one observer will be needed. If groups converge, they will be treated as one group for the duration of the sampling round. Observers should make a note of converging groups in the comments section on the back of the datasheets. If a target whale group goes out of sight during any point of a sampling round and whales are seen again before the end of the same round, then this observed group will be considered the same group if seen in same general grid area of the previous sighting. If a whale group goes out of sight and stays out of sight for more than 20 minutes, it will be treated as a separate sample group if spotted after that time period and given its own unique sampling round number.

***Statistical Note: In this study, the sample is each distinct group of belugas. If one group of whales is followed for one or several sampling rounds, then our sample size is still only N = 1. This is an important distinction for purposes of analysis and to avoid pseudoreplicaton.***

***Remote Camera Operation:***
In addition to direct observations of whales, remote color motion-sensitive cameras with infrared illumination at low light (Reconyx PC 85)[2] are used to collect presence/absence data on belugas during times when observers cannot be present. A minimum of two cameras will be deployed on the north bank of Eagle River- one at the mouth facing SSW (perpendicular to water flow) and one approximately 200 M upstream from the mouth facing W). Cameras will be set on time-lapse mode with a one minute time increment between shots and with the motion-detection feature enabled. Camera times will be synched with each other and all other devices used to record time during the observational period (watches, video cameras, etc). Each camera will be serviced (change card and batteries) every two weeks and checked for obvious external problems (alignment change, lens fouling, etc) every day when feasible.

Camera cards will be stored in a waterproof container while in the field. The data from cards will be downloaded onto an external hard drive dedicated solely to this project and backed up on a redundant drive. Analysis of the images from each card will be completed as soon as possible after removal from the field with a general time limit of two weeks from removal to analysis. Data will be entered into a Microsoft Access database.

Analysis will be performed by one experienced team member (having analyzed at least one full seasons worth of camera data (or at least 30,000 images) or two team members that have analyzed less than 30,000 images each. Analysis of the images will include searching photos[3] for presence of beluga whales

[2] Inclusion of specific company names or products in this document does not indicate endorsement by the U.S. Army or any other entity named herein.
[3] Images are named using an alpha-numeric scheme, are numbered sequentially, and ordered sequentially in the folder created by the camera. Images taken under the motion-detection mode are named with a number proceeded by an "M" (e.g. M000101.jpg). These images are placed at the beginning of the sequence of images in a particular folder, even if they were the last images taken. Images taken under the time-lapse mode are named with a number proceeded by a "T" (e.g. T000101.jpg) and are placed after the images taken by the motion-detection images.

and harbor seals in the river. Analysts will indicate camera number, folder name,[4] starting time and date of the folder, presence of beluga(s) or other marine mammals, any other unusual event (e.g. boat passage, other mammalian presence, etc), and the date and end time of each folder. When an entry is made about the presence of a beluga, the analyst must note the following information: date, time, image number, number of whales, color of whales, and tidal state[5].

At the end of the folder, the analyst will then subtract the number of unusable images (night images, images taken while servicing camera, etc) from the gross number of images and record the resulting figure as the total number of usable images.  The analyst will also note if observers were present on the flats during the dates covered in a folder and if so during which times. The presence/absence data from both the camera and the observational studies will then be compared. This comparison will allow a measure of how effective the cameras are at recording the actual presence/absence of whales.

## SB5. Recreation Monitoring

### SA5.1 Recreational Facility Survey

Purpose. Establish a protocol for recreational facilities surveys.

Stocked Lakes Surveys. Conduct survey on at least an annual basis, preferably twice a year (once prior to the start of the summer season in April/May, and once at the close of the season in September/October). Visit each road-accessible stocked lake and gather data on the following:
1. Alaska Department of Fish and Game SIGNS. Location, condition, number.
2. ACCESS. Type of access such as hiking trail, ATV trail, road, boat ramp. Condition (is erosion occurring). Surface material (gravel, dirt, emergent wetland, etc). Original forms should already contain information about how to access the site (distance from highway, distance from main road, etc.).
3. RECREATION. Type of recreation available (fishing, camping, picnicking).
4. FISH STOCKING. Current stocking information from Alaska Department of Fish and Game – available from local F&G office or on the web.
5. IMPACTS. Written description of visible disturbance, trash, wheel ruts, foot paths, etc.
6. WETLANDS. Specific written description of wetlands at the lake and disturbance to them.
7. PHOTOS. Take photos of the lake, access, signs, impacts, wetlands and other items for documentation.
8. MONITORING HISTORY. Record the date of your visit.

Compile a report with the above information listed on one sheet per lake. Compare with previous years to document any changes in conditions and to list all previous dates under the Monitoring History section. Include a representative photo and stocking history table.

Other Recreational Areas. Compile a list of other established recreational sites that should be monitored on an annual basis, if any. Conduct the survey annually, and gather the following data:
1. SIGNAGE. Location, condition, number.

[4] Folders will be named using the following convention: ERFCamera#_start date-end date. Thus a group of images taken with Camera number 3 during from 1 July to 1 August, 2009 would be archived in a folder called “ERFCam3_1July-1Aug09”
[5] i.e. low tide, ¼  flood/ebb, ½ flood/ebb, ¾ flood/ebb, full tide—these are based on comparison to a series of photos indicating physical landmarks associated with each tidal stage.

2. ACCESS. Type of access such as hiking trail, ATV trail, road, boat ramp. Condition (is erosion occurring). Surface material (gravel, dirt, emergent wetland, etc). During the initial survey, record information about how to access the site (distance from highway, distance from main road, etc.).
3. RECREATION. Type of recreation available.
4. IMPACTS. Written description of visible disturbance, trash, wheel ruts, foot paths, etc.
5. WETLANDS. Specific written description of any wetlands at the site and disturbance to them.
6. PHOTOS. Take photos of the site, access, signs, impacts, wetlands and other items for documentation.
7. MONITORING HISTORY. Record the date of your visit.

Compile a report with the above information listed on one sheet per site. Compare with previous years to document any changes in conditions and to list all previous dates under the Monitoring History section. Include a representative photo.

## SA5.2 Trespass Structure Monitoring

1. Purpose: Establish a monitoring protocol for locating trespass structures and documenting trail establishment and expansion.

2. Background: For over 25 years, trespass structures have been erected on Fort Wainwright, primarily in the Tanana Flats Training Area. Structures ranged from simple tent stands to elaborate homes. The number of structures grew rapidly during the 1990s, with nearly 55 structures identified in the late 1990s before abatement measures were adopted. A continuing effort is required to identify new or previously overlooked structures. In addition to trespass structure monitoring, new trails can be documented at the same time.

3. Protocol:

3.1. Tanana Flats Training Area and Donnelly Training Area West.

3.1.1. Flights will be arranged with helicopters or fixed-wing aircraft. Personnel from G-3 Range Control and Directorate of Public Works Environmental will act as observers. Post Safety, Provost Marshal’s Office and others may also be involved. A systematic approach that follows known airboat and riverboat access routes is best. In addition, air strips and the lands around them will be checked. Off-road recreational vehicle trails from these air strips will be flown. Any new trails will be mapped with the Global Positioning System.

3.1.2. When structures are identified, potential helicopter landing zones will also be identified. Alternate methods of access will be noted if landing zones are not available.

3.1.3. Areas may also be accessed by airboat or riverboat, although generally trespass monitoring by boat will be conducted concurrently with other field projects.

3.1.4. During the winter, many of these areas are also accessible by snowmachine, which will allow for additional monitoring from the existing trail network.

3.2. Road-accessible areas (Yukon Training Area, Donnelly Training Area East, Fort Richardson).

3.2.1. Monitoring will be conducted on an opportunistic basis when conservation personnel are in the field for other projects.

3.3. Data to be collected.

3.3.1. Global Positioning System points and photographs will be taken.

3.3.2. A brief inventory of contents may also be conducted.

3.3.3. When possible, at the time a structure is located it should be posted with a notice to vacate the property. This is a standard notice and contains POC phone numbers.

3.3.4. An effort should be made to locate information about the owners, which can sometimes be found at the cabin. (This information is used during the removal and clean-up phase.)

3.4. At a minimum, surveys will be conducted annually over all areas and may be combined with other aerial surveys.
3.5. All data on new or newly discovered cabins will be kept on the 'TAC matrix.xls' file at Fort Wainwright.
3.6. A more comprehensive method of trail creation/expansion monitoring involves Geographic Information System analysis comparing new aerial photography with previous photographs. This can only be accomplished when new aerial photos are flown.

# SC. MANAGEMENT

## SC1. Introduction

The following section details the procedures and standard practices used by USAG-AK for survey and monitoring of its natural resources. These procedures and standard practices are grouped by program area.

## SC2. Watershed Management

Watershed management includes procedures to manage soils, water, vegetation, and landforms across all USAG-AK lands. Watershed management constitutes standard procedures and practices for soils management and wetlands management. Any work in navigable water or wetlands will most likely need a permit from the U.S. Army Corps of Engineer Regulatory Branch and from the State of Alaska Department of Natural Resources Office of Habitat Management and Permitting. Where practicable, "softer" bioengineered techniques will be employed, such as those discussed in McCullah and Gray (2005) and Walter et al. (2005), rather than traditional hardened techniques such as riprap.

### SC2.1 Soils Management

The following section describes standard procedures for erosion and sediment control structures, gravel pit development and reclamation, guard rail, gate, fencing and post installation, sign and Seibert stake installation, and permanent and temporary soil stabilization practices.

#### SC2.1.1 Erosion and Sediment Control Structures

The structures in this section that can be used in-stream or on a streambank below the ordinary high water of the water body (e.g., rock barbs, gabions, grid pavers, outlet protection, riprap) would require permits from state (Alaska Department of Natural Resources Office of Habitat Management and Permitting, Alaska Department of Environmental Conservation) and federal agencies (U.S. Army Corps of Engineers). Any streambank stabilization project would also require a permit from the same state and federal agencies.

##### *SC2.1.1.1 Rock Barbs*

Rock barb in-stream structures should be the last resort at solving streambank erosion problems, especially in streams that have been designated as anadromous. In addition, these structures must be designed by an experienced engineer/hydrologist. If these structures are not designed and constructed properly, they can be destructive. Rock barbs consist of constructed rock piles set in the streambed installed to deflect erosive water forces away from vulnerable streambanks. Rock barbs are keyed into the existing bank slope and streambed, extend into the stream and are pointed upstream. Barb length, barb spacing, rock size and gradation and depth of bed and bank keying are dependant on stream size and hydrology, soils and protection requirements. Rock barbs can include wire basket enclosures for rock placement.

### *SC2.1.1.2 Brush Barrier*

Brush barriers are perimeter sediment control structures used to prevent soil in storm water runoff from leaving a construction site. Brush barriers are constructed of material such as small tree branches, root mats, stone, or other debris left over from site clearing and grubbing. In some configurations, brush barriers are covered with a filter cloth to stabilize the structure and improve barrier efficiency.
Brush barriers are applicable to sites where there is enough material from clearing and grubbing to form a sufficient mound of debris along the perimeter of an area. The drainage area for brush barriers must be no greater than 0.25 acre per 100 feet of barrier length. In addition, the drainage slope leading down to a brush barrier must be no greater than 2:1 and no longer than 100 feet. Brush barriers have limited usefulness because they are constructed of materials that decompose.

A brush barrier can be constructed using only cleared material from a site, but it is recommended that the mound be covered with a filter fabric barrier to hold the material in place and increase sediment barrier efficiency. Whether a filter fabric cover is used or not, the barrier mound should be at least 3 feet high and 5 feet wide at its base. Material with a diameter larger than 6 inches should not be used, as this material may be too bulky and create void spaces where sediment and runoff will flow through the barrier. The edge of the filter fabric cover should be buried in a trench 4 inches deep and 6 inches wide on the drainage side of the barrier. This is done to secure the fabric and create a barrier to sediment while allowing storm water to pass through the water-permeable filter fabric. The filter fabric should be extended just over the peak of the brush mound and secured on the down-slope edge of the fabric by fastening it to twine or small-diameter rope that is staked securely.

Brush barriers are an effective storm water runoff control only when the contributing flow has a slow velocity. Brush barriers are therefore not appropriate for high-velocity flow areas. A large amount of material is needed to construct a useful brush barrier. For sites with little material from clearing, alternative perimeter controls such as a fabric silt fence may be more appropriate. Although brush barriers provide temporary storage for large amounts of cleared material from a site, this material will ultimately have to be removed from the site after construction activities have ceased and the area reaches final stabilization.

Brush barriers should be inspected after each significant rainfall event to ensure continued effectiveness. If channels form through void spaces in the barrier, the barrier should be reconstructed to eliminate the channels. Accumulated sediment should be removed from the uphill side of the barrier when sediment height reaches between 1/3 and 1/2 the height of the barrier. When the entire site has reached final stabilization, the brush barrier should be removed and disposed of properly.

Brush barriers can be effective at reducing off-site sediment transport, and their effectiveness is greatly increased with the use of a fabric cover on the up-slope side of the brush barrier.

### *SC2.1.1.3 Check Dams*

Check dams are small, temporary dams constructed across a swale or channel. Check dams can be constructed using gravel, rock, sandbags, logs, or straw bales and are used to slow the velocity of concentrated flow in a channel. By reducing the velocity of the water flowing through a swale or channel, check dams reduce the erosion in the swale or channel. As a secondary function, check dams can also be used to catch sediment from the channel itself or from the contributing drainage area as storm water runoff flows through the structure. However, the use of check dams in a channel should not be a substitute for the use of other sediment-trapping and erosion control measures. As with most other temporary structures, check dams are most effective when used in combination with other storm water and erosion and sediment control measures.

Check dams should be used in swales or channels that will be used for a short period of time where it is not practical to line the channel or implement other flow control practices. In addition, check dams are appropriate where temporary seeding has been recently implemented but has not had time to take root and fully develop.

Check dams are usually used in small open channels with a contributing drainage area of 2 to 10 acres. For a given swale or channel, multiple check dams, spaced at appropriate intervals, can increase overall effectiveness. If dams are used in a series, they should be spaced such that the base of the upstream dam is at the same elevation as the top of the next downstream dam.

Check dams can be constructed from a number of different materials. Most commonly, they are made of rock, logs, sandbags, or straw bales. When using rock or stone, the material diameter should be 2 to 15 inches. Logs should have a diameter of 6 to 8 inches. Regardless of the material used, careful construction of a check dam is necessary to ensure its effectiveness. Dams should be installed with careful placement of the construction material. Mere dumping of the dam material into a channel is not appropriate and will reduce overall effectiveness.

All check dams should have a maximum height of 3 feet. The center of the dam should be at least 6 inches lower than the edges. This design creates a weir effect that helps to channel flows away from the banks and prevent further erosion. Additional stability can be achieved by implanting the dam material approximately 6 inches into the sides and bottom of the channel. When installing more than one check dam in a channel, outlet stabilization measures should be installed below the final dam in the series. Because this area is likely to be vulnerable to further erosion, riprap, geotextile lining, or some other stabilization measure is highly recommended.

Check dams should not be used in live, flowing streams unless approved by an appropriate regulatory agency. Because the primary function of check dams is to slow runoff in a channel, they should not be used as a stand-alone substitute for other sediment-trapping devices. Also, leaves have been shown to be a significant problem by clogging check dams in the fall. Therefore, they might necessitate increased inspection and maintenance.

Check dams should be inspected after each storm event to ensure continued effectiveness. During inspection, large debris, trash, and leaves should be removed. The center of a check dam should always be lower than its edges. If erosion or heavy flows cause the edges of a dam to fall to a height equal to or below the height of the center, repairs should be made immediately. Accumulated sediment should be removed from the upstream side of a check dam when the sediment has reached a height of approximately one-half the original height of the dam (measured at the center). In addition, all accumulated sediment should also be removed prior to removing a check dam. Removal of a check dam should be completed only after the contributing drainage area has been completely stabilized. Permanent vegetation should replace areas from which gravel, stone, logs, or other material have been removed. If the check dam is constructed of rock or gravel, maintenance crews should be sure to clear all small rock and gravel pieces from vegetated areas before attempting to mow the grass between check dams. Failure to remove stones and gravel can result in serious injury from flying debris.

Field experience has shown that rock check dams are more effective than silt fences or straw bales to stabilize wet weather ditches. For long channels, check dams are most effective when used in a series, creating multiple barriers to sediment-laden runoff.

#### *SC2.1.1.4 Construction Entrances*

The purpose of stabilizing entrances to a construction site is to minimize the amount of sediment leaving the area as mud and sediment attached to motorized vehicles. Installing a pad of gravel over filter cloth where construction traffic leaves a site can help stabilize a construction entrance. As a vehicle drives over the gravel pad, mud and sediment are removed from the vehicle's wheels and off-site transport of soil is reduced. The gravel pad also reduces erosion and rutting on the soil beneath the stabilization structure. The filter fabric separates the gravel from the soil below, preventing the gravel from being ground into the soil. The fabric also reduces the amount of rutting caused by vehicle tires by spreading the vehicle's weight over a larger soil area than just the tire width.

In addition to removal of sediment by simple friction of vehicle tires on the gravel pad, a vehicle washing station can be established at the site entrance. Wash stations, if used on a routine basis, remove a substantial amount of sediment from vehicles before they leave the site. Diverting runoff from vehicle washing stations into a sediment trap helps ensure that sediment removed from vehicles is kept on-site and disposed of properly.

Typically, stabilized construction entrances are installed at locations where construction traffic leaves or enters an existing paved road. However, the applicability of site entrance stabilization should be extended to any roadway or entrance where vehicles will access or leave the site. From a public relations point of view, stabilizing construction site entrances can be a worthwhile exercise. If the site entrance is the most publicly noticeable part of a construction site, stabilized entrances can improve the appearance to passersby and improve public perception of the construction project.

All entrances to a site should be stabilized before construction and further disturbance of the site area begins. The stabilized site entrances should be long and wide enough so that the largest construction vehicle that will enter the site will fit in the entrance with room to spare. If many vehicles are expected to use an entrance in any one day, the site entrance should be wide enough for the passage of two vehicles at the same time with room on either side of each vehicle. If a site entrance leads to a paved road, the end of the entrance should be "flared" (made wider as in the shape of a funnel) so that long vehicles do not leave the stabilized area when turning onto or off of the paved roadway. If a construction site entrance crosses a stream, swale, or other depression, a bridge or culvert should be provided to prevent erosion from unprotected banks. Stone and gravel used to stabilize the construction site entrance should be large enough so that they are not carried off-site with vehicle traffic. In addition, sharp-edged stone should be avoided to reduce the possibility of puncturing vehicle tires. Stone or gravel should be installed at a depth of at least 6 inches for the entire length and width of the stabilized construction entrance.

Although stabilizing a construction entrance is a good way to help reduce the amount of sediment leaving a site, some soil may still be deposited from vehicle tires onto paved surfaces. To further reduce the chance of these sediments polluting storm water runoff, sweeping of the paved area adjacent to the stabilized site entrance is recommended. For sites using wash stations, a reliable water source to wash vehicles before leaving the site might not be initially available. In this case, water may have to be trucked to the site at additional cost.

Stabilization of site entrances should be maintained until the remainder of the construction site has been fully stabilized. Stone and gravel might need to be periodically added to each stabilized construction site entrance to keep the entrance effective. Soil that is tracked off-site should be swept up immediately for proper disposal. For sites with wash racks at each site entrance, sediment traps will have to be constructed and maintained for the life of the project. Maintenance will entail the periodic removal of sediment from the traps to ensure their continued effectiveness.

Stabilizing construction entrances to prevent sediment transport off-site is effective only if all entrances to the site are stabilized and maintained. Also, stabilization of construction site entrances may not be very effective unless a wash rack is installed and routinely used. This can be problematic for sites with multiple entrances and high vehicle traffic.

### *SC2.1.1.5 Drainage Swale*

A drainage swale is a channel with a lining of vegetation, riprap, asphalt, concrete, or other material and is used to intercept and divert flow to a suitable outlet. It is constructed by excavating a channel and applying the appropriate stabilization. They can be used to convey runoff from the bottom or top of a slope. For swales draining a disturbed area, the outlet can lead to a sediment trapping device prior to its release.

### *SC2.1.1.6 Earth Dike*

Earthen perimeter controls usually consist of a dike or a combination dike and channel constructed along the perimeter of a disturbed site. Simply defined, an earthen perimeter control is a ridge of compacted soil, often accompanied by a ditch or swale with a vegetated lining, located at the top or base of a sloping disturbed area. Depending on their location and the topography of the landscape, earthen perimeter controls can achieve one of two main goals. Located on the upslope side of a site, earthen perimeter controls help to prevent surface runoff from entering a disturbed construction site. An earthen structure located upslope can improve working conditions on a construction site by preventing an increase in the total amount of sheet flow runoff traveling across the disturbed area and thereby lessen erosion on the site. Alternatively, earthen perimeter control structures can be located on the downslope side of a site to divert sediment-laden runoff created on-site to on-site sediment trapping devices, preventing soil loss from the disturbed area.

These control practices can be referred to by a number of terms, including temporary diversion dikes, earth dikes, or interceptor dikes. Generally speaking, however, all earthen perimeter controls are constructed in a similar fashion with a similar objective to control the velocity and/or route of sediment-laden storm water runoff.

Temporary diversion dikes are applicable where it is desirable to divert flows away from disturbed areas such as cut or fill slopes and to divert runoff to a stabilized outlet. The dikes can be erected at the top of a sloping area or in the middle of a slope to divert storm water runoff around a disturbed construction site. In this way, earth dikes can be used to reduce the length of the slope across which runoff will travel, thereby reducing the erosion potential of the flow. If placed at the bottom of a sloping disturbed area, diversion dikes can divert flow to a sediment trapping device. Temporary diversion dikes are usually appropriate for drainage basins smaller than 5 acres, but with modifications they can be capable of servicing areas as large as 10 acres. With regular maintenance, earthen diversion dikes have a useful life span of approximately 18 months.

To prevent storm water runoff from entering a site, earthen perimeter controls can be used to divert runoff from areas upslope around the disturbed construction site. This is accomplished by constructing a continuous, compacted earthen mound along the upslope perimeter of the site. As an additional control measure, a shallow ditch can accompany the earthen mound.

The siting of earthen perimeter controls depends on the topography of the area surrounding a specific construction site and on whether the goal is to prevent sediment-laden runoff from entering the site or to keep storm water runoff from leaving the site. When determining the appropriate size and design of earthen perimeter controls, the shape of the surrounding landscape and drainage patterns should be considered. Also, the amount of runoff to be diverted, the velocity of runoff in the diversion, the erodibility of soils on the slope and within the diversion channel or swale are essential design considerations.

Diversion dikes should be constructed and fully stabilized prior to commencement of major land disturbance. This will maximize the effectiveness of the diversion measure as an erosion and sediment control device.

The top of earthen perimeter controls designed as temporary flow diversion measures should be at least 2 feet wide. Bottom width at ground level is typically 6 feet. The minimum height for earthen dikes should be 18 inches, with side slopes no steeper than 2:1. For points where vehicles will cross the dike, the slope should be no steeper than 3:1 and the mound should be constructed of gravel rather than soil. This will prolong the life of the dike and increase effectiveness at the point of vehicle crossing.

If a channel is excavated along the dike, its shape can be parabolic, trapezoidal, or V-shaped. Prior to excavation or mound building, all trees, brush, stumps and other objects in the path of the diversion structure should be removed and the base of the dike should be tilled before laying the fill. The maximum design flow velocity should range from 1.5 to 5.0 feet per second, depending on the vegetative cover and soil texture.

Most earthen perimeter structures are designed for short-term, temporary use. If the expected life span of the diversion structure is greater than 15 days, it is strongly recommended that both the earthen dike and the accompanying ditch be seeded with vegetation immediately after construction. This will increase the stability of the perimeter control and can decrease the need for frequent repairs and maintenance.
Earth dikes are an effective means of diverting sediment-laden storm water runoff around a disturbed area. However, the concentrated runoff in the channel or ditch has increased erosion potential. To alleviate this erosion capability, diversion dikes must be directed to sediment trapping devices, where erosion sediment can settle out of the runoff before being discharged to surface waters. Examples of appropriate sediment trapping devices that might be used in conjunction with temporary diversion structures include a sediment basin, a sediment chamber/filter, or any other structure designed to allow sediment to be collected for proper disposal.

If a diversion dike crosses a vehicle roadway or entrance, its effectiveness can be reduced. Wherever possible, diversion dikes should be designed to avoid crossing vehicle pathways. Earthen diversion dikes should be inspected after each rainfall to ensure continued effectiveness. The dike should be maintained at the original height, and any decrease in height due to settling or erosion should be repaired immediately. To remain effective, earth dikes must be compacted at all times. Regardless of rainfall frequency, dikes should be inspected at least once every two weeks for evidence of erosion or deterioration.

When properly placed and maintained, earth dikes used as temporary diversions are effective for controlling the velocity and direction of storm water runoff. Used by themselves, they do not have any pollutant removal capability. Diversion dikes must be used in combination with an appropriate sediment trapping device at the outfall of the diversion channel.

#### *SC2.12.1.7 Filter Berms*
A gravel or stone filter berm is a temporary ridge made up of loose gravel, stone, or crushed rock that slows, filters, and diverts flow from an open traffic area and acts as an efficient form of sediment control. A specific type of filter berm is the continuous berm, a geosynthetic fabric that encapsulates sand, rock, or soil.

#### *SC2.1.1.8 Gabions*
Gabions are free-draining walls constructed by filling large baskets with broken stone. The baskets are made from galvanized steel mesh, woven strips, or plastic mesh. They can also be made from wickerwork, bamboo slats, nylon or polypropylene. A typical basket is rectangular with dimensions of about 50 cm by 15 cm.

Retention is achieved from a combination of the stones weight and its interlocking and frictional strength. The wall face is battered at approximately 6 degrees from the vertical. The maximum height is approximately 10 m. They are constructed with either a stepped face or a stepped back.

The permeability and flexibility of gabions make them suitable when the retained material is likely to be saturated and when the bearing quality of the soil is poor. Wire mesh gabions have two forms, baskets, which are used for walls, and mattresses, which are used for revetments and river linings.

The actual shape of gabion retaining walls is trapezoidal. However, the outer and inner faces may be straight or steeped. The width of the horizontal tread of the steps should not exceed the depth of the gabion. Walls can have a plain outer face, preferably built to a batter for appearance and to increase resistance to overturning. Similarly walls with stepped faces should be tilted toward the backfill. Counter forts or buttresses may be incorporated in the construction.

For large walls where the cross section is greater than 4m wide, an economy can be made by using a cellular form of construction. The outer and inner gabion faces are tied by bulkheads of gabions and the cells between them filled with stone. The size and shape of the cells should be proportioned to achieve internal stability.

For rivers, the permeability of the gabions allows water in the backfill to drain freely during the falling water levels. However, the use of filters should be considered to prevent leaching of minerals.

### *SC2.1.1.9 Gradient Terraces*

Gradient terraces are made of either earthen embankments or ridge and channel systems that are properly spaced and are constructed with an adequate grade. They reduce damage from erosion by collecting and redistributing surface runoff to stable outlets at slower speeds and by increasing the distance of overland runoff flow. They also surpass smooth slopes in holding moisture and help to minimize sediment loading of surface runoff.

Gradient terraces are most suitable for use in areas with an existing or expected water erosion problem and no vegetation, and they are only effective when there are suitable runoff outlets provided. They are usually limited for use on long, steep slopes with a water erosion problem, or where it is anticipated that water erosion will be a problem. They should not be constructed on slopes containing rocky or sandy soil. Gradient terraces should be designed with adequate and appropriate outlets and should be installed according to a well-developed plan after conduction of an engineering survey and layout. Acceptable outlets include grassed waterways, vegetated areas, or tile outlets. Any outlet that is used should be able to redirect surface runoff away from the terraces and toward an area that is not susceptible to erosion or other damage.

General specifications require that:

- Whenever possible, vegetative cover should be used in the outlet.
- At the junction of the terrace and the outlet, the terrace's water surface design elevation should be no lower than the outlet's water surface design elevation when both are performing at design flow.
- During construction of the terrace system, dust control procedures should be followed.
- Proper vegetation/stabilization practices should be followed while constructing these features.
- Gradient terraces are not appropriate for use on sandy, steep, or shallow soils. If too much water permeates the soil in a terrace system, sloughing could occur, and cut and fill costs could increase substantially.

Regular inspections of the terraces should occur after any major storms and at least once a year to ensure that the terraces are structurally sound and have not been subject to erosion.

#### *SC2.1.1.10 Cobble Drains*

Cobble drains are typically installed underneath roads crossing sub-surface water flows to prevent fill material saturation and impairment. Cobble drains consist of aggregate 3” to 7” with no fines set into excavated trench approximately 3’ below the road sub-base. Trench width and location are determined by surface scours prior to installation. Cobble drains typically run to a downhill slope and are installed perpendicular to the road base. The outlet is left open.

Once the aggregate is installed, a layer of geotextile extending a minimum of 2’ over the trench sides is installed and the area is backfilled with material in 6” compacted lifts to desired height.

A backhoe (Case 235) or an excavator (CAT 320) is used for cobble drain excavation.

#### *SC2.1.1.11 Stand Pipes*

Stand pipes, also known as drop inlets, are used in areas where ponding water levels must be maintained without being allowed to overtop a road or pad. Stand pipes are constructed out of corrugated metal pipe and their installation is similar to regular corrugated metal pipe culvert installation, but include a vertical section of pipe attached to a 90 degree elbow. The height of the vertical pipe inlet is set at an elevation that maintains desired water levels. Stand pipes typically include a trash rack grate assembly installed on the top of the vertical pipe to prevent coarse debris from entering the pipe.

A backhoe (Case 235) or an excavator (CAT 320) is used for stand pipes excavation. Stand pipes are installed on top of a 6” layer of D1 bedding and covered with 6” layers of compacted fill material until desired coverage is met.

#### *SC2.1.1.12 Gravel or Stone Filter Berm*

A gravel or stone filter berm is a temporary ridge made up of loose gravel, stone, or crushed rock that slows, filters, and diverts flow from an open traffic area and acts as an efficient form of sediment control. A specific type of filter berm is the continuous berm, a geosynthetic fabric that encapsulates sand, rock, or soil. Gravel or stone filter berms are most suitable in areas where vehicular traffic needs to be rerouted because roads are under construction, or in traffic areas within a construction site.
The following construction guidelines should be considered when building the berm:

- Well-graded gravel or crushed rock should be used to build the berm.
- Berms should be spaced according to the steepness of the slope, with berms spaced closer together as the slope increases.
- Sediment that builds up should be removed and disposed of and the filter material should be replaced. Regular inspection should indicate the frequency of sediment removal needed.
- Berms are intended to be used only in gently sloping areas. They do not last very long, and they require maintenance due to clogging from mud and soil on vehicle tires.
- The berm should be inspected after every rainfall to ensure that sediment has not built up and that no damage has been done by vehicles. It is important that repairs be performed at the first sign of deterioration to ensure that the berm is functioning properly.
- The effectiveness of a rock filter berm depends upon rock size, slope, soil, and rainfall amount. The continuous berm is not staked into the ground and no trenching is required. Effectiveness has been rated at up to 95% for sediment removal, but is highly dependent on local conditions including hydrologic, hydraulic, topographic, and sediment characteristics.

*SC2.1.1.13 Grid Pavers*

Cement or plastic grid pavers can be used to line ditches or stream bottoms where vehicles cross in order to control erosion, stabilize stream bottoms, and minimize rutting or shifting of material. Grid pavers also reduce storm water runoff, help prevent flooding, reduce non-point source pollution, reduce imperviousness of the area, and minimize site disturbance.

*SC2.1.1.14 Outlet Protection*

This involves placing structurally lined aprons or other appropriate energy-dissipating devices at the outlets of pipes to reduce the velocity of storm water flows and thereby prevent scouring at storm water outlets, protecting the outlet structure and minimizing potential for erosion downstream. If outlets are draining directly into streams that support fish, then design and construction methods need to be carefully taken into consideration.

*SC2.1.1.15 Permanent Diversions*

Diversions can be constructed by creating channels across slopes with supporting earthen ridges on the bottom sides of the slopes. The ridges reduce slope length, collect storm water runoff, and deflect the runoff to acceptable outlets that convey it without erosion.

Diversions are used in areas where runoff from higher elevations poses a threat of property damage or erosion. Diversions can also be used to promote the growth of vegetation in areas of lower elevations. Finally, diversions protect upland slopes that are being damaged by surface and/or shallow subsurface flow by reducing slope length, which minimizes soil loss.

<u>Ridge.</u> A cross section of the earthen ridge must have side slopes no steeper than 2:1, a width at the design water elevation of at least 4 feet, a minimum freeboard of 0.3 feet, and a 10% settlement factor included in the design.

<u>Outlet.</u> Four acceptable outlets for the conveyance of runoff and their construction specifications include:

I. Storm water conveyance channel

A permanently designed waterway, containing appropriate vegetation, that is appropriately shaped and sized to carry storm water runoff away from developing areas without any damage from erosion. The following are general specifications that are required for channel construction:

- All obstructions and unsuitable material, such as trees, roots, brush, and stumps, and any excess soil, should be removed from the channel area and disposed of properly.
- The channel must meet grade and cross-section specifications, and any fill that is used must be compacted to ensure equal settlement.
- Parabolic and triangular-shaped, grass-lined channels should not have a top width of more than 30 feet.
- Trapezoidal, grass-lined channels may not have a bottom width of more than 15 feet unless there are multiple or divided waterways, they have a riprap center, or other methods of controlling the meandering of low flows are provided.
- If grass-lined channels have a base flow, a stone center or subsurface drain or another method for managing the base flow must be provided.
- All channels must have outlets that are protected from erosion.

II. Level spreader

A level spreader is a device used to prevent erosion and to improve infiltration by spreading storm water runoff evenly over the ground as shallow flow instead of through channels. It usually involves a depression in the soil surface that disperses flow onto a flatter area across a slight slope and then releases the flow onto level vegetated areas. This reduces flow speed and increases infiltration. Construction specifications for level spreaders include:

- Level spreaders should be constructed on natural soils and not on fill material or easily erodible soils.
- There should be a level entrance to the spreader to ensure the flow can be evenly distributed.
- Heavy equipment and traffic should not be allowed on the level spreader, as they can cause compaction of soil and disturbance of the slope grade.
- The spreader should be regraded if ponding or erosion channels develop.
- Dense vegetation should be sustained and damaged areas reseeded when necessary.

III. Outlet protection

This involves placing structurally lined aprons or other appropriate energy-dissipating devices at the outlets of pipes to reduce the velocity of storm water flows and thereby prevent scouring at storm water outlets, protect the outlet structure, and minimize potential for erosion downstream. Construction specifications for outlet protection practices require the following:

- No bends occur in the horizontal alignment.
- There is no slope along the length of the apron, and the invert elevations must be equal at the receiving channel and the apron's downstream end.
- No overfall at the end of the apron is allowed.
- If a pipe discharges into a well-defined channel, the channel's side slopes may not be steeper than 2:1.
- The apron is lined with riprap, grouted riprap, concrete, or gabion baskets, with all riprap conforming to standards and specifications, and the median-sized stone for riprap is specified in the plan.
- Filter cloth, conforming to standards and specifications, must be placed between riprap and the underlying soil to prevent any soil movement through the riprap.
- All grout for grouted riprap must be one part Portland cement for every 3 parts sand, mixed thoroughly with water. Once stones are in place, the spaces between them are to be filled with grout to a minimum depth of 6 inches, with the deeper portions choked with fine material.
- All concrete aprons must be installed as specified in the plan.
- The end of the paved channel in a paved channel outlet must be smoothly joined with the receiving channel section, with no overfall at the end of the paved section.

IV. Paved flume

A paved flume is a permanent, paved channel that is constructed on a slope through which storm water runoff can be diverted down the face of the slope without causing erosion problems on or below the slope. Paved flumes are not recommended unless very high flows with excessive erosive power are expected, because increased runoff velocity might magnify erosion at the flume's outfall. Outfall protection must be provided to prevent damage from high velocity flows. The paved flume also prevents infiltration of surface runoff, exacerbating off-site runoff problems. Where possible, vegetated channels should be used –additional stabilization can be provided with riprap, gabions, or turf reinforcement mats.

Construction specifications for paved flumes require that:

- The subgrade must be constructed to required elevations, with all soft portions and unsuitable material removed and replaced with suitable material, it must be thoroughly compacted and smoothed to a uniform surface, and must be moist when the concrete is poured.
- The slope of the structure may be no more than 1.5:1.
- Curtain walls must be attached to the beginning and end of any paved flumes that are not adjoined to another structure, and the curtain walls should be the same width as the flume channel, at least 6 inches thick, and extend at least 18 inches into the soil under the channel.
- Anchor lugs must be spaced no more than 10 feet apart on center, continuous with the channel lining for the length of the flume; they must be the same width as the bottom of the flume channel, at least 6 inches thick, and extend at least 1 foot into the soil under the channel.
- There should be at least a 4-inch thickness of class A-3 concrete with welded wire fabric in the center of the flume channel for reinforcement.
- Traverse joints should be provided at approximately 20-foot intervals or when there are more than 45 minutes between consecutive concrete placements in order to control cracks.
- Expansion joints should be provided approximately every 90 feet.
- Outlets of the paved flumes should be protected from erosion through the use of an energy-dissipating device with outlet protection, as described previously.

<u>Stabilization.</u> Immediately after the ridge and channel are constructed, they must be seeded and mulched along with any disturbed areas that drain into the diversion. Sediment-trapping measures must remain in place in case the upslope area is not stabilized to prevent soil from moving into the diversion. All obstructions and unsuitable material, such as trees, brush, and stumps, must be removed from the channel area and disposed of so the diversion may function properly. The channel must meet grade and cross-section specifications, and any fill that is used must be free from excessive organic debris, rocks, or other unsuitable material and must be compacted to ensure equal settlement. Disturbed areas should be permanently stabilized according to applicable local standards and specifications.
The area around the channel that is disturbed by its construction must be stabilized so that it is not subject to similar erosion as the steep slope the channel is built to protect.

Diversions should be inspected after every rainfall and a minimum of once every two weeks before final stabilization. Channels should be cleared of sediment, repairs made when necessary, and seeded areas reseeded if a vegetative cover is not established.

### *SC2.1.1.16 Riprap*

Riprap is a permanent, erosion-resistant layer made of stones. It is intended to protect soil from erosion in areas of concentrated runoff. Riprap may also be used to stabilize slopes that are unstable because of seepage problems.

Riprap can be used to stabilize cut-and-fill slopes; channel side slopes and bottoms; inlets and outlets for culverts, bridges, slope drains, grade stabilization structures, and storm drains; and streambanks and grades.

Riprap may be unstable on very steep slopes, especially when rounded rock is used. For slopes steeper than 2:1, consider using other materials such as geotextiles and rootwads for erosion protection. If riprap is being planned for the bottom of a permanently flowing channel, the bottom can be modified to enhance fish habitat. This can be done by constructing riffles and pools which simulate natural conditions. These riffles promote aeration and the pools provide deep waters for habitats. If riprap structures are placed on the bottom of a stream to create riffles and pools, they should be designed by an engineer/hydrologist who has experience with these types of projects. If installed and/or designed improperly, these structures can be very destructive to a stream and the existing fish habitat.

The following are some design recommendations for riprap installation:

- Gradation. A well-graded mixture of rock sizes should be used instead of one uniform size.
- Quality of stone. Riprap must be durable so that freeze/thaw cycles do not decompose it in a short time; most igneous stones such as granite have suitable durability.
- Riprap depth. The thickness of riprap layers should be at least two times the maximum stone diameter.
- Filter material. Filter material is usually required between riprap and the underlying soil surface to prevent soil from moving through the riprap; a filter cloth material or a layer of gravel is usually used for the filter.
- Leaching protection. Leaching can be controlled by installing a riprap gradation small enough to act as a filter against the channel base material, or a protective filter can be installed between the riprap and the base material.
- Riprap limits. The riprap should extend from the ordinary high water elevation or to a point where vegetation will be satisfactory to control erosion.
- Curves. Riprap should extend to five times the bottom width upstream and downstream of the beginning and ending of the curve as well as the entire curved section.
- Riprap size. The size of riprap to be installed depends on site-specific conditions (e.g., hydrology, bank steepness, cause of erosion, etc.).

Riprap is limited by steepness of slope, because slopes greater than 2:1 have potential riprap loss due to erosion and sliding. When working within flowing streams, measures should be taken to prevent excessive turbidity and erosion during construction. Construction should occur when water levels are at their lowest. The Office of Habitat Management and Permitting prefers that this type of work be conducted when water levels are low and the introduction of sediment can be minimized. Installing temporary in-stream structures and/or blocking streams should be a last option for this type of work. Riprap should be inspected annually and after major storms. If riprap has been damaged, repairs should be made promptly to prevent a progressive failure. If repairs are needed repeatedly at one location, the site should be evaluated to determine if the original design conditions have changed. Channel obstructions such as trees and sediment bars can change flow patterns and cause erosive forces that may damage riprap.

### *SC2.1.1.17 Silt Fence*

Silt fences are used as temporary perimeter controls around sites where there will be soil disturbance due to construction activities. They consist of a length of filter fabric stretched between anchoring posts spaced at regular intervals along the site perimeter. The filter fabric should be entrenched in the ground between the support posts. When installed correctly and inspected frequently, silt fences can be an effective barrier to sediment leaving the site in storm water runoff.

Silt fences are generally applicable to construction sites with relatively small drainage areas. They are appropriate in areas where runoff will be occurring as low-level shallow flow, not exceeding 0.5 cfs. The drainage area for silt fences generally should not exceed 0.25 acre per 100-foot fence length. Slope length above the fence should not exceed 100 feet.

Material for silt fences should be a pervious sheet of synthetic fabric such as polypropylene, nylon, polyester, or polyethylene yarn, chosen based on minimum synthetic fabric requirements, as shown in Table 1.

Table SC2.1. Minimum requirements for silt fence construction.

| Physical Property | Requirements |
|---|---|
| Filtering Efficiency | 75 - 85% (minimum): highly dependent on local conditions |
| Tensile Strength at 20% (maximum) Elongation | Standard Strength: 30 lbs/linear inch (minimum)<br>Extra Strength: 50 lbs/linear inch (minimum) |
| Ultraviolet Radiation | 90% (minimum) |
| Slurry Flow Rate | 0.3 gal/ft2/min (minimum) |

If a standard strength fabric is used, it can be reinforced with wire mesh behind the filter fabric. This can increase the effective life of the fence. In any case, the maximum life expectancy for synthetic fabric silt fences is approximately 6 months, depending on the amount of rainfall and runoff for a given area. Burlap fences have a much shorter useful life span, usually only up to two months.

Stakes used to anchor the filter fabric should be either wooden or metal. Wooden stakes should be at least 5 feet long and have a minimum diameter of 2 inches if a hardwood such as oak is used. Softer woods such as pine should be at least 4 inches in diameter. When using metal posts in place of wooden stakes, they should have a minimum weight of 1.00 to 1.33 lb/linear foot. If metal posts are used, attachment points are needed for fastening the filter fabric, using wire ties.

A silt fence should be erected in a continuous fashion from a single roll of fabric to eliminate unwanted gaps in the fence. If a continuous roll of fabric is not available, the fabric should overlap from both directions only at stakes or posts, with a minimum overlap of 6 inches. A trench should be excavated to bury the bottom of the fabric fence at least 6 inches below the ground surface. This will help prevent gaps from forming near the ground surface that would render the fencing useless as a sediment barrier.

The height of the fence posts should be between 16 and 34 inches above the original ground surface. If standard strength fabric is used in combination with wire mesh, the posts should be spaced no more than 10 feet apart. If extra-strength fabric is used without wire mesh reinforcement, the support posts should be spaced no more than 6 feet apart.

The fence should be designed to withstand the runoff from a 10-year peak storm event and, once installed, should remain in place until all areas up-slope have been permanently stabilized by vegetation or other means.

Silt fences should not be installed along areas where rocks or other hard surfaces will prevent uniform anchoring of fence posts and entrenching of the filter fabric. This will greatly reduce the effectiveness of silt fencing and can create runoff channels leading off-site. Silt fences are not suitable for areas where large amounts of concentrated runoff are likely. In addition, open areas where wind velocity is high may present a maintenance challenge, as high winds may accelerate deterioration of the filter fabric. Silt fences should not be installed across streams, ditches, or waterways.

When the pores of the fence fabric become clogged with sediment, pools of water are likely to form on the uphill side of fence. Siting and design of the silt fence should account for this and care should be taken to avoid unnecessary diversion of storm water from these pools that might cause further erosion damage.

Silt fences should be inspected regularly and frequently as well as after each rainfall event to ensure that they are intact and that there are no gaps at the fence/ground interface or tears along the length of the fence. If gaps or tears are found, they should be repaired or the fabric should be replaced immediately. Accumulated sediments should be removed from the fence base when the sediment reaches one-third to one-half the height of the fence. Sediment removal should occur more frequently if accumulated sediment is creating noticeable strain on the fabric and there is the possibility of the fence failing from a sudden storm event. When the silt fence is removed, the accumulated sediment also should be removed.

The following effectiveness ranges for silt fence constructed of filter fabric that are properly installed and well maintained: average total suspended solids removal of 70%, sand removal of 80 to 90%, silt-loam removal of 50 to 80%, and silt-clay-loam removal of 0 to 20%. Removal rates are highly dependent on local conditions and installation.

#### *SC2.1.1.18 Storm Drain Inlet Protection*

Storm drain inlet protection measures are controls that help prevent soil and debris from site erosion from entering storm drain drop inlets. Typically, these measures are temporary controls that are implemented prior to large-scale disturbance of the surrounding site. These controls are advantageous because their implementation allows storm drains to be used during even the early stages of construction activities. The early use of storm drains during project development significantly reduces the occurrence of future erosion problems.

Three temporary control measures to protect storm drain drop inlets are:

- Excavation around the perimeter of the drop inlet
- Fabric barriers around inlet entrances
- Block and gravel protection

Excavation around a storm drain inlet creates a settling pool to remove sediments. Weep holes protected by gravel are used to drain the shallow pool of water that accumulates around the inlet. A fabric barrier made of porous material erected around an inlet can create an effective shield to erosion sediment while allowing water flow into the storm drain. This type of barrier can slow runoff velocity while catching soil and other debris at the drain inlet. Block and gravel inlet protection uses standard concrete blocks and gravel to form a barrier to sediments while permitting water runoff through select blocks laid sideways. In addition to the materials listed above, limited temporary storm water drop inlet protection can also be achieved with the use of straw bales or sandbags to create barriers to sediment. For permanent storm drain drop inlet protection after the surrounding area has been stabilized, sod can be installed as a barrier to slow storm water entry to storm drain inlets and capture erosion sediments. This final inlet protection measure can be used as an aesthetically pleasing way to slow storm water velocity near drop inlet entrances and to remove sediments and other pollutants from runoff.

All temporary controls should have a drainage area no greater than 1 acre per inlet. It is also important for temporary controls to be constructed prior to disturbance of the surrounding landscape. Excavated drop inlet protection and block and gravel inlet protection are applicable to areas of high flow where overflow is anticipated into the storm drain. Fabric barriers are recommended for smaller, relatively flat drainage areas (slopes less than 5% leading to the storm drain). Temporary drop inlet control measures are often used in combination with each other and other storm water control techniques.

With the exception of sod drop inlet protection, these controls should be installed before any soil disturbance in the drainage area. Excavation around drop inlets should be dug a minimum of 1 foot deep (2 feet maximum) with a minimum excavated volume of 35 $yd^3$ per acre disturbed. Side slopes leading to the inlet should be no steeper than 2:1. The shape of the excavated area should be designed such that the dimensions fit the area from which storm water is anticipated to drain. For example, the longest side of an excavated area should be along the side of the inlet expected to drain the largest area.

Fabric inlet protection should be staked close to the inlet to prevent overflow on unprotected soils. Stakes should be used with a minimum length of 3 feet, spaced no more than 3 feet apart. A frame should be constructed for fabric support during overflow periods and should be buried at least 1 foot below the soil surface and rise to a height no greater than 1.5 feet above ground. The top of the frame and fabric should be below the downslope ground elevation to prevent runoff bypassing the inlet.

Block and gravel inlet barrier height should be 1 foot minimum (2 feet maximum), and mortar should not be used. The bottom row of blocks should be laid at least 2 inches below the soil surface flush against the drain for stability. One block in the bottom row should be placed on each side of the inlet on its side to allow drainage. Wire mesh (1/2 inch) should be placed over all block openings to prevent gravel from entering the inlet, and gravel (3/4 to 1/2 inch in diameter) should be placed outside the block structure at a slope no greater than 2:1.

Sod inlet protection should not be considered until the entire surrounding drainage area is stabilized. The sod should be laid so that it extends at least 4 feet from the inlet in each direction to form a continuous mat around the inlet, laying sod strips perpendicular to the direction of flows. The sod strips should be staggered such that strip ends are not aligned, and the slope of the sodded area should not be steeper than 4:1 approaching the drop inlet.

Storm water drop inlet protection measures should not be used as stand-alone sediment control measures. To increase inlet protection effectiveness, these practices should be used in combination with other measures, such as small impoundments or sediment traps. Temporary storm drain inlet protection is not intended for use in drainage areas larger than 1 acre. Generally, storm water inlet protection measures are practical for relatively low-sediment, low-volume flows. Frequent maintenance of storm drain control structures is necessary to prevent clogging. If sediment and other debris clog the water intake, drop intake control measures can actually cause erosion in unprotected areas.

All temporary control measures must be checked after each storm event. To maintain the sediment capacity of the shallow settling pools created from these techniques, accumulated sediment should be removed from the area around the drop inlet (excavated area, around fabric barrier, or around block structure) when the sediment capacity is reduced by approximately 50%. Additional debris should be removed from the shallow pools on a periodic basis. Weep holes in excavated areas around inlets can become clogged and prevent water from draining out of shallow pools that form. Should this happen, unclogging the water intake may be difficult and costly.

Excavated drop inlet protection may be used to improve the effectiveness and reliability of other sediment traps and barriers, such as fabric or block and gravel inlet protection. However, as a whole, the effectiveness of inlet protection is low for erosion and sediment control, long-term pollutant removal, and low for habitat and stream protection.

#### *SC2.1.1.19 Subsurface Drains*
These are perforated pipes or conduit placed beneath the surface of the ground at a designated depth and grade. They are used to drain an area by lowering the water table. A high water table can saturate soils and prevent the growth of certain vegetation. Drains can help prevent soil from “slipping” down the hill.

#### *SC2.1.1.20 Wind Fences and Sand Fences*

Sand fences are barriers of small, evenly spaced wooden slats or fabric erected to reduce wind velocity and to trap blowing sand. They can be used effectively as perimeter controls around open construction sites to reduce the off-site movement of fine sediments transported by wind. They also prevent off-site damage to roads, streams, and adjacent properties. The spaces between fence slats allow wind and sediment to pass through but reduce the wind velocity, which causes sediment deposition along the fence.

Wind fences are applicable to areas with a preponderance of loose, fine-textured soils that can be transported off-site by high winds. They are especially advantageous for construction sites with large areas of cleared land or in arid regions where blowing sand and dust are especially problematic. Shorefront development sites also benefit from using wind fences because they promote the formation of frontal dunes.

Effective trapping of sediment and reduction of wind velocity occurs only when the fence is erected perpendicular to the prevailing wind. Although wind fences have been shown effective up to 22.5 degrees from perpendicular, they should be erected as close to perpendicular to the movement of wind as possible. Multiple fences can be erected to increase sediment-trapping efficiency, depending on the degree of protection desired. Linear rows of fence 2 to 4 feet high and spaced 20 to 40 feet apart can be installed. When used on shoreline beaches, wind fences should be installed well away from the incoming tide.
A wind fence does not control sediment carried in storm water runoff. Wind fences should be installed in conjunction with other sediment and erosion control measures that capture sediment from runoff.
Wind fences require periodic inspection to ensure that there are no breaks or gaps. Repairs should be made immediately. Sand and sediment should be cleaned from the fence area periodically to prevent their mobilization by storm water runoff.

Wind fences are very effective for promoting dune formation along shoreline areas, but are not adequate as a primary dust control or sediment-trapping measure for perimeters of construction sites. They should be used only in conjunction with other erosion and sediment control practices. Wind and sand fences are relatively inexpensive to purchase, install, and maintain because they are small, easy to transport, lightweight, and constructed of low-cost materials.

#### *SC2.1.1.21 Sediment Filters and Sediment Chambers*

Sediment filters are a class of sediment-trapping devices typically used to remove pollutants, primarily particulates, from storm water runoff. Generally speaking, sediment filters have four basic components: (1) inflow regulation, (2) pretreatment, (3) filter bed, and (4) outflow mechanism. Sediment chambers are merely one component of a sediment filter system.

Inflow regulation refers to the diversion of storm water runoff into the sediment-trapping device. After runoff enters the filter system, it enters a pretreatment sedimentation chamber. This chamber, used as a preliminary settling area for large debris and sediments, usually consists of nothing more than a wet detention basin. As water reaches a predetermined level, it flows over a weir into a filter bed of some filter medium. The filter medium is typically sand, but it can consist of sand, soil, gravel, peat, compost, or a combination of these materials. The purpose of the filter bed is to remove smaller sediments and other pollutants from the storm water as it percolates through the filter medium. Finally, treated flow exits the sediment filter system via an outflow mechanism to return to the storm water conveyance system.
Sediment filter systems can be confined or unconfined, on-line or off-line, and aboveground or belowground. Confined sediment filters are constructed with the filter medium contained in a structure, often a concrete vault. Unconfined sediment filters are constructed without encasing the filter medium in a confining structure. As one example, sand might be placed on the banks of a permanent wet pond detention system to create an unconfined filter. On-line systems are designed to retain storm water in its original stream channel or storm drain system. Off-line systems are designed to divert storm water.

Sediment filters may be a good alternative for smaller construction sites where the use of a wet pond is being considered as a sediment-trapping device. Their applicability is wide ranging, and they can be used in urban areas with large amounts of highly impervious area. Because confined sand filters are man-made soil systems, they can be applied to most development sites and have few constraining factors. However, for all sediment filter systems, the drainage area to be serviced should be no more than 10 acres.

The type of filter system chosen depends on the amount of land available and the desired location within the site. Examples of sediment filter systems include the "Delaware" sand filter and the "Austin" sand filter. The Austin sand filter, so named because it first came into widespread use in Austin, Texas, is a surface filter system that can be used in areas with space restrictions. If space is at a premium, an underground filter may be the most appropriate choice. For effective storm water sediment control at the perimeter of a site, the Delaware sand filter might be a good choice. This configuration consists of two parallel, trench-like chambers installed at a site's perimeter. The first trench (sediment chamber) provides pretreatment sediment settling before the runoff spills into the second trench (filter medium).

Available space is likely to be the most important siting and design consideration when choosing an appropriate sediment-filtering system. As mentioned previously, the decision as to which configuration is implemented on a particular site is dependent on the amount of space on a site. Another important consideration when deciding to install sediment-filtering systems is the amount of available head. Head refers to the vertical distance available between the inflow of the filter system and the outflow point. Because most filtering systems depend on gravity as the driving force to move water through the system, if a certain amount of head is not available, the system will not be effective and might cause more harm than good. For surface and underground sand filters, a minimum head of 5 feet is suggested. Perimeter sand filters such as the two-chambered Delaware sand filter should have a minimum available head of 2 to 3 feet. The depth of filter media will vary depending on media type, but for sand filters it is recommended that the sand (0.04-inch diameter or smaller) be at least 18 inches deep, with a minimum of 4 to 6 inches of gravel for the bed of the filter. Throughout the life of a sediment filter system, there will be a need for frequent access to assess continued effectiveness and perform routine maintenance and emergency repairs. Because most maintenance of sediment filters requires manual rather than mechanical removal of sediments and debris, filter systems should be located to allow easy access.

Sediment filters are usually limited to the removal of pollutants from storm water runoff. They must be used in combination with other storm water management practices to provide flood protection. Sediment filters should not be used on fill sites or near steep slopes. In addition, sediment filters are likely to lose effectiveness in cold regions because of freezing conditions.

Maintenance of storm water sediment filters can be relatively high compared to other sediment-trapping devices. Routine maintenance includes raking the filter medium and removal of surface sediment and trash. These maintenance chores will likely need to be accomplished by manual labor rather than mechanical means. Depending on the medium used in the structure, the filter material may have to be changed or replaced up to several times a year. This will depend, among other things, on rainfall intensity and the expected sediment load.

Sediment filters of all media types should be inspected monthly and after each significant rainfall event to ensure proper filtration. Trash and debris removal should be removed during inspections. Sediment should be removed from filter inlets and sediment chambers when 75 % of the storage volume has been filled. Because filter media have the potential for high loadings of metals and petroleum hydrocarbons, the filter medium should be periodically analyzed to prevent it from reaching levels that would classify it as a hazardous waste. This is especially true on sites where solvents or other potentially hazardous chemicals will be used. Spill prevention measures should be implemented as necessary. The top 3 to 4 inches of the filter medium should be replaced on an annual basis, or more frequently if drawdown does not occur within 36 hours of a storm event.

Treatment effectiveness will depend on a number of factors, including treatment volume; whether the filter is on-line or off-line, confined or unconfined; and the type of land use in the contributing drainage area. Sand filter removal rates are "high" for sediment and trace metals and "moderate" for nutrients, BOD (biological oxygen demand), and fecal coliform. Removal rates can be increased slightly by using a peat/sand mixture as the filter medium due to the adsorptive properties of peat. Estimated pollutant removal capabilities for various storm water sediment filter systems is shown in Table SC2.2.

Table SC2.2. Pollutant removal efficiencies for sand filters.

| **Source** | **Filter System** | **TSS[a] (%)** | **TP[a] (%)** | **TN[a] (%)** | **Other Pollutants** |
|---|---|---|---|---|---|
| Claytor and Schueler 1996 | Surface Sand Filter | 85 | 55 | 35 | Bacteria: 40-80%<br>Metals: 35-90% |
| | Perimeter Sand Filter | 80 | 65 | 45 | Hydrocarbons: 80% |
| Livingston 1997 | Sand Filter (general) | 60–85 | 30–75 | 30–60 | Metals: 30–80% |

[a]TSS=total suspended solids; TP=total phosphorus; TN=total nitrogen

### *SC2.1.1.22 Temporary Sediment Basin and Rock Dams*

Sediment basins and rock dams are two ways to capture sediment from storm water runoff before it leaves a construction site. Both structures allow a shallow pool to form in an excavated or natural depression where sediment from storm water runoff can settle. Basin dewatering is achieved either through a single riser and drainage hole leading to a suitable outlet on the downstream side of the embankment or through the gravel of the rock dam. In both cases, water is released at a substantially slower rate than would be possible without the control structure.

A sediment basin can be constructed by excavation or by erecting an earthen embankment across a low area or drainage swale. The basin can be either a temporary (up to 3 years) structure or a permanent storm water control measure. Sediment basins can be designed to drain completely during dry periods, or they can be constructed so that a shallow, permanent pool of water remains between storm events. However, depending on the size of the basin constructed, the basin may be considered a wet pond and subject to additional regulation.

Rock dams are similar in design to sediment basins with earthen embankments. These damming structures are constructed of rock and gravel and release water from the settling pool gradually through the spaces between the rock aggregate.

Sediment basins are normally used for drainage areas of 5 to 100 acres. They can be temporary or permanent structures. Generally, sediment basins designed to be used for up to 3 years are described as temporary, while those designed for longer service are said to be permanent. Temporary sediment basins can be converted into permanent storm water runoff management ponds, but they must meet all regulatory requirements for wet ponds.

Sediment basins are applicable in drainage areas where it is anticipated that other erosion controls, such as sediment traps, will not be sufficient to prevent off-site transport of sediment. Choosing to construct a sediment basin with either an earthen embankment or a stone/rock dam will depend on the materials available, location of the basin, and desired capacity for storm water runoff and settling of sediments. Rock dams are suitable where earthen embankments would be difficult to construct or where riprap is readily available. Rock structures are also desirable where the top of the dam structure is to be used as an overflow outlet. These riprap dams are best for drainage areas of less than 50 acres. Earthen damming structures are appropriate where failure of the dam will not result in substantial damage or loss of property or life. If properly constructed, sediment basins with earthen dams can handle storm water runoff from drainage basins as large as 100 acres.

The potential sites for sediment basins should be investigated during the initial site evaluation. Basins should be constructed before any grading takes place within the drainage area. For structures that will be permanent, the design of the basin should be completed by a qualified professional engineer experienced in the design of dams.

Sediment basins with rock dams should be limited to a drainage area of 50 acres. Rock dam height should be limited to 8 feet with a minimum top width of 5 feet. Side slopes for rock dams should be no steeper than 2:1 on the basin side of the structure and 3:1 on the outlet side. The basin side of the rock dam should be covered with fine gravel from top to bottom for a minimum of 1 foot. This will slow the drainage rate from the pool that forms and allow time for sediments to settle. The detention time should be at least 8 hours.

Sediment basins with earthen embankments should be outfitted with a dewatering pipe and riser set just above the sediment removal cutoff level. The riser pipe should be located at the deepest point of the basin and extend no farther than 1 foot below the level of the earthen dam. A water permeable cover should be placed over the primary dewatering riser pipe to prevent trash and debris from entering and clogging the spillway. To provide an additional path for water to enter the primary spillway, secondary dewatering holes can be drilled near the base of the riser pipe, provided the holes are protected with gravel to prevent sediment from entering the spillway piping.

To ensure adequate drainage, the following equation can be used to approximate the total area of dewatering holes for a particular basin:

$A_o = (A_s \text{ x } (2h) / (T \text{ x } C_d \text{ x } 20{,}428)$
where
$A_o$ = total surface area of dewatering holes, $ft^2$;
$A_s$ = surface area of the basin, $ft^2$;
h = head of water above the hole, ft;
$C_d$ = coefficient of contraction for an orifice, approximately 0.6; and
T = detention time or time needed to dewater the basin, hours.

In all cases, such structures should be designed by an appropriate professional based on local hydrologic, hydraulic, topographic, and sediment conditions.

Neither a sediment basin with an earthen embankment nor a rock dam should be used in areas of continuously running water (live streams). The use of sediment basins is not intended for areas where failure of the earthen or rock dam will result in loss of life, or damage to homes or other buildings. In addition, sediment basins should not be used in areas where failure will prevent the use of public roads or utilities.

Routine inspection and maintenance of sediment basins is essential to their continued effectiveness. Basins should be inspected after each storm event to ensure proper drainage from the collection pool and to determine the need for structural repairs. Erosion from the earthen embankment or stones moved from rock dams should be replaced immediately. Sediment basins must be located in an area that is easily accessible to maintenance crews for removal of accumulated sediment. Sediment should be removed from the basin when its storage capacity has reached approximately 50%. Trash and debris from around dewatering devices should be removed promptly after rainfall events.

The effectiveness of a sediment basin depends primarily on the sediment particle size and the ratio of basin surface area to inflow rate. Basins with a large surface area-to-volume ratio will be most effective. Studies have shown that the following equation relating surface area and peak inflow rate gives a trapping efficiency greater than 75% for most sediment in the Coastal Plain and Piedmont regions of the southeastern United States:

$A = 0.01q$

where A is the basin surface area in acres, and q is the peak inflow rate in cubic feet per second.
It estimates average total suspended solids (TSS) removal rate for all sediment basins from 55% to 100%, with an average effectiveness of 70%.

#### *SC2.1.1.23 Sediment Trap*

Sediment traps are small impoundments that allow sediment to settle out of runoff water. They are usually installed in a drainage way or other point of discharge from a disturbed area. Temporary diversions can be used to direct runoff to the sediment trap. Sediment traps are used to detain sediments in storm water runoff and trap the sediment to protect receiving streams, lakes, drainage systems, and the surrounding area.

Sediment traps are formed by excavating an area or by placing an earthen embankment across a low area or drainage swale. An outlet or spillway is often constructed using large stones or aggregate to slow the release of runoff.

Sediment traps are generally temporary control measures to slow concentrated runoff velocity and catch sediment, and they can be used with other temporary storm water control measures. They are commonly used at the outlets of storm water diversion structures, channels, slope drains, construction site entrance wash racks, or any other runoff conveyance that discharges waters containing erosion sediment and debris. Sediment traps can also be used as part of a storm water drop intake protection system when the inlet is located below a disturbed area and will receive runoff with large amounts of sediment.

Sediment traps can simplify the storm water control plan design process by trapping sediment at specific spots at a construction site. Therefore, they should be installed as early in the construction process as possible. Natural drainage patterns should be noted, and sites where runoff from potential erosion can be directed into the traps should be selected. Sediment traps should not be located in areas where their failure due to storm water runoff excess can lead to further erosive damage of the landscape. Alternative diversion pathways should be designed to accommodate these potential overflows.

A sediment trap should be designed to maximize surface area for infiltration and sediment settling. This will increase the effectiveness of the trap and decrease the likelihood of backup during and after periods of high runoff intensity. Although site conditions will dictate specific design criteria, the approximate storage capacity of each trap should be at least 1,800 $ft^3$ per acre of total drainage area. The volume of a natural sedimentation trap can be approximated by the following equation:

Volume ($ft^3$) = 0.4 x surface area ($ft^2$) x maximum pool depth (ft)

Care should be taken in the siting and design phase to situate sediment traps for easy access by maintenance crews. This will allow for proper inspection and maintenance on a periodic basis. When excavating an area for sediment trap implementation, side slopes should not be steeper than 2:1 and embankment height should not exceed 5 feet from the original ground surface. All embankments should be machine compacted to ensure stability. To reduce flow rate from the trap, the outlet should be lined with well-graded stone.

The spillway weir for each temporary sediment trap should be at least 4 feet long for a 1-acre drainage area and increased by 2 feet for each additional drainage acre added, up to a maximum drainage area of 5 acres.

Sediment traps should not be used for drainage areas greater than 5 acres. The effective life span of these temporary structures is usually limited to 24 months. Although sediment traps allow for settling of eroded soils, because of their short detention periods for storm water, they typically do not remove fine particles such as silts and clays.

The primary maintenance consideration for temporary sediment traps is the removal of accumulated sediment from the basin. This must be done periodically to ensure the continued effectiveness of the sediment trap. Sediments should be removed when the basin reaches approximately 50% sediment capacity. A sediment trap should be inspected after each rainfall event to ensure that the trap is draining properly. Inspectors should also check the structure for damage from erosion. The depth of the spillway should be checked and maintained at a minimum of 1.5 feet below the low point of the trap embankment. Sediment trapping efficiency is a function of surface area, inflow rate, and the sediment properties. Those traps that provide pools with large length-to-width ratios have a greater chance of success. Sediment traps have a useful life of approximately 18 to 24 months, although ultimately effectiveness depends on the amount and intensity of rainfall and erosion, and proper maintenance. An estimate average total suspended solids removal rate of 60%. An efficiency rate of 75% can be obtained for most Coastal Plain and Piedmont soils by using the following equation:

Surface area at design flow (acres) = (0.01) peak inflow rate (cfs)

The cost of installing temporary sediment traps ranges from $0.20 to $2.00 per cubic foot of storage (about $1,100 per acre of drainage). The average cost is approximately $0.60 per cubic foot of storage
A temporary slope drain is a flexible conduit extending the length of a disturbed slope and serving as a temporary outlet for a diversion. Temporary slope drains, also called pipe slope drains, convey runoff without causing erosion on or at the bottom of the slope. This practice is a temporary measure used during grading operations until permanent drainage structures are installed and until slopes are permanently stabilized. They are typically used for less than two years. Temporary slope drains can be used on most disturbed slopes to eliminate gully erosion problems resulting from concentrated flows discharged at a diversion outlet.

Recently graded slopes that do not have permanent drainage measures installed should have a temporary slope drain and a temporary diversion installed. A temporary slope drain used in conjunction with a diversion conveys storm water flows and reduces erosion until permanent drainage structures are installed.

The following are design recommendations for temporary slope drains:

- The drain should consist of heavy-duty material manufactured for the purpose and have grommets for anchoring at a spacing of 10 feet or less.
- Minimum slope drain diameters should be observed for varying drainage areas.

- The entrance to the pipe should consist of a standard flared section of corrugated metal; the corrugated metal pipe should have watertight joints at the ends; the rest of the pipe is typically corrugated plastic or flexible tubing, although for flatter, shorter slopes, a polyethylene-lined channel is sometimes used.
- The height of the diversion at the pipe should be the diameter of the pipe plus 0.5 foot.
- The outlet should be located at a reinforced or erosion-resistant location.
- The area drained by a temporary slope drain should not exceed 5 acres. Physical obstructions substantially reduce the effectiveness of the drain. Other concerns are failures from overtopping because of inadequate pipe inlet capacity and reduced diversion channel capacity and ridge height.

The slope drain should be inspected after each rainfall to determine if capacity was exceeded or if blockages occurred. Repairs should be made promptly. Construction equipment and vehicular traffic must be rerouted around slope drains.

### *SC2.1.1.24 Temporary Stream Crossings*

A temporary steam crossing is a structure erected to provide a safe and stable way for construction vehicles to cross a running watercourse. The primary purpose of such a structure is to provide streambank stabilization, reduce the risk of damaging the streambed or channel, and reduce the risk of sediment loading from construction traffic. A temporary stream crossing may be a bridge, a culvert, or a ford.

Temporary stream crossings are applicable wherever heavy construction equipment must be moved from one side of a stream channel to the other, or where lighter construction vehicles will cross the stream a number of times during the construction period. In either case, an appropriate method for ensuring the stability of the streambanks and preventing large-scale erosion is necessary.

A bridge or culvert is the best choice for most temporary stream crossings. If properly designed, each can support heavy loads and materials used to construct most bridges, and culverts can be salvaged after they are removed. Fords are appropriate in steep areas subject to flash flooding, where normal flow is shallow or intermittent across a wide channel. Fords should be used only where stream crossings are expected to be infrequent. Stream crossings shall be made from bank-to-bank in a direction substantially perpendicular to the direction of stream flow. Stream crossings shall be made only at locations with gradually sloping banks, not at sheer or cut banks. Timing restrictions for crossing a stream may apply depending on type of fish species are present and habitat type.

Because of the potential for stream degradation, flooding, and safety hazards, stream crossings should be avoided on a construction site whenever possible. Consideration should be given to alternative routes to accessing a site before arrangements are made to erect a temporary stream crossing. If it is determined that a stream crossing is necessary, an area where the potential for erosion is low should be selected. If possible, the stream crossing structure should be selected during a dry period to reduce sediment transport into the stream.

If needed, over-stream bridges are generally the preferred temporary stream crossing structure. The expected load and frequency of the stream crossing and fish habitat and species present, however, will govern the selection of a bridge as the correct choice for a temporary stream crossing. Bridges usually cause minimal disturbance to a stream's banks and cause the least obstruction to stream flow and fish migration. They should be constructed only under the supervision and approval of a qualified engineer.

As general guidelines for constructing temporary bridges, clearing and excavation of the stream shores and bed should be kept to a minimum. Sufficient clearance should be provided for floating objects to pass under the bridge. Abutments should be parallel to the stream and on stable banks. If the stream is less than 8-feet wide at the point a crossing is needed, no additional in-stream supports should be used. If the crossing is to extend across a channel wider than 8 feet (as measured from top of bank to top of bank), the bridge should be designed with one in-water support for each 8 feet of stream width.

A temporary bridge should be anchored by steel cable or chain on one side only to a stable structure on shore. Examples of anchoring structures include large-diameter trees, large boulders, and steel anchors. By anchoring the bridge on one side only, there is a decreased risk of downstream blockage or flow diversion if a bridge is washed out.

When constructing a culvert, filter cloth should be used to cover the streambed and streambanks to reduce settlement and improve the stability of the culvert structure. The filter cloth should extend a minimum of 6 inches and a maximum of 1 foot beyond the end of the culvert and bedding material. The culvert piping should not exceed 40 feet in length and should be of sufficient diameter to allow for complete passage of flow during peak flow periods. In addition, if fish are present in the stream, the culvert diameter should be designed in relation to the stream width and depth and fish use in that portion of the water body. The culvert pipes should be covered with a minimum of 1 foot of aggregate. If multiple culverts are used, at least 1 foot of aggregate should separate the pipes.

Fords should be constructed of stabilizing material such as large rocks, but keep in mind that fish passage must be maintained at all times when a structure is placed across a stream. Material and size need to be considered carefully.

Bridges can be considered the greatest safety hazard of all temporary stream crossing structures if not properly designed and constructed. Bridges might also prove to be more costly in terms of repair costs and lost construction time if they are washed out or collapse.

However, the construction and removal of culverts are usually very disturbing to the surrounding area, and erosion and downstream movement of soils is often great. Culverts can also create obstructions to flow in a stream and inhibit fish migration. Depending on their size, culverts can be blocked by large debris in a stream and are therefore vulnerable to frequent washout.

If given a choice between building a bridge or a culvert as a temporary stream crossing, a bridge is preferred because of the relative minimal disturbance to streambanks and the opportunity for unimpeded flow through the channel.

The approaches to fords often have high erosion potential. In addition, excavation of the streambed and the approach to lay riprap or other stabilization material causes major stream disturbance. Mud and other debris are transported directly into the stream unless the crossing is used only during periods of low flow. Temporary stream crossings should be inspected at least once a week and after all significant rainfall events. If any structural damage is reported to a bridge or culvert, construction traffic should stop use of the structure until appropriate repairs are made. Evidence of streambank erosion should be repaired immediately.

Fords should be inspected closely after major storm events to ensure that stabilization materials remain in place. If the material has moved downstream during periods of peak flow, the lost material should be replaced immediately.

Both temporary bridges and culverts provide an adequate path for construction traffic crossing a stream or watercourse.

Generally speaking, temporary bridges are more expensive to design and construct than culverts. Bridges are also associated with higher maintenance and repair costs should they fail. Additional costs may accrue to the site team in terms of lost construction time if a temporary structure is washed out or otherwise fails.

#### *SC2.1.1.25 Pipe Slope Drains*

A temporary slope drain is a flexible conduit extending the length of a disturbed slope and serving as a temporary outlet for a diversion. Temporary slope drains, also called pipe slope drains, convey runoff without causing erosion on or at the bottom of the slope. This practice is a temporary measure used during grading operations until permanent drainage structures are installed and until slopes are permanently stabilized. They are typically used for less than two years. Temporary slope drains can be used on most disturbed slopes to eliminate gully erosion problems resulting from concentrated flows discharged at a diversion outlet.

### SC2.1.2 Gravel Pit Development

Pits sites are typically between 0.5 to 4.9 acres in size and require access upgrades. The pit extraction of gravel material is categorized into three activities: vertical, horizontal and pond. Pit boundaries are established and include extraction areas, overburden dumps and stockpile areas. Pits are developed to maintain adequate drainage through the strategic placement of berms, ditches and culverts. In addition, pits are developed and operated to provide for efficient and effective reclamation.

Approximately 5,000cy to12,000cy of gravel material are extracted from project specific pits, such as hilltops and small (>0.5 acre) gravel deposits. These pits remain in operation during a 1 to 2 year project cycle and are typically located adjacent to improved roads. Large material sites (<2 acres) are developed to provide a minimum of 100,000cy of material and are typically located off a hardened, 20' wide, single lane spur road with a minimum of four 10'w x 50'l turn-outs, two on each side of road spaced evenly along entire road length. The average footprint of a large material pit site is 4 - 4.9 acres.

The two types of gravel material sites used on USAG-AK land are formal pits and meandering side barrow. These material sites are typically developed within three miles of proposed construction activity sites and are chosen based on soils maps, ground truthing and sample testing. Sample tests include soil and aggregate typing, sieve analysis and compaction proctors. Overburden should be stockpiled and kept separated from mining activities as it can be a valuable tool when used for reclamation once the material site has been exhausted.

A. Vertical Extraction

Vertical extraction requires the exposure of gravel aggregates by removing and stockpiling surface vegetation and overburden, which is typically 6" to 36" in depth and comprised of organics and silts. This activity is accomplished with a medium to large sized CAT D7 - D9 or equivalent, crawler tractor (dozer) with a straight "bull" blade. The overburden and vegetation material is rolled to the outer edges of the pit footprint and piled to an average height of 10' to 15'. Overburden piles are placed and notched to facilitate adequate drainage.

Once the overburden is removed and piled, gravel aggregate is excavated by three methods. The most common method is large dozers (CAT D7 D9) pushing 12" + layers of gravel material into loose piles. The second method involves tracked excavators (CAT 320/245) that dig down 20' + into gravel deposit and loose-pile the material on the surface. The third method of gravel excavation requires the use of scrapers (CAT 627/631). Scrapers peel 6" layers of gravel material into the scraper box and then spread the material on a large sloping stockpile or directly at the project site. Stockpiles typically do not exceed 30' in height.

Stockpiled material is loaded into end dumps and semi rock trailers (i.e., belly and side dumps) by loaders (CAT 266/288) or excavators (CAT 320/245) and transported to the project site.

B. Horizontal Extraction

Horizontal extraction requires the exposure of hillside gravel aggregates by removing and stockpiling surface vegetation and overburden, which is typically 3" to 24" in depth and comprised of organics and silts. This activity is accomplished with a medium to large sized CAT D6 - D9 or equivalent, crawler tractor (dozer) with a straight "bull" blade. The hillside overburden and vegetation material is push to the outer sides of the pit. Care is taken to avoid overburden deposits uphill and downhill of the excavation activity. A 100' x 50' (minimum) pad at the base of the hill is also cleared of overburden and leveled to provide a pad for stockpiling and loading activities. Overburden piles average a height of 8' to 10' and are placed to facilitate adequate drainage.

Once the overburden is removed and piled, gravel aggregate is excavated by two methods. The most common method is large dozers (CAT D7 D9) pushing 12" + layers of gravel material downhill into loose piles. The second method involves tracked excavators (CAT 320/245) that dig into the hillside gravel deposit and loose pile the material on the pad.

Stockpiled material is loaded into end dumps and semi rock trailers (i.e., belly and side dumps) by loaders (CAT 266/288) or excavators (CAT 320/245) and transported to the project site.

C. Pond Extraction

Pond extraction of gravel materials requires the use of a dragline. This equipment utilizes 0.75cy to 3cy cabled buckets to dredge gravel material 15' to 40' deep from the pond bank and bed. A 100' x 100' pad is hardened adjacent to the pond, and the dragline casts dredged material into loose stockpiles on the pad. Stockpiles can reach 30' in height.

Stockpiled material is loaded into end dumps and semi rock trailers (i.e., belly and side dumps) by loaders (CAT 266/288) or excavators (CAT 320/245) and transported to the project site.

D. Pit Material

The gravel materials excavated from pit operations can used "as is" or modified, depending on aggregate size and percentages. Gravels are categorized as pitrun or manufactured.

Pitrun, the most commonly used gravel material on USAG-AK lands, is excavated gravel material that contains the appropriate aggregate sizes and %ages required for hardening activities and does not require modification or mixing. Pitrun quality is variable and may contain large aggregates or excessive fines.

Pitrun is used directly from excavated stockpiles and is typically installed as a base and capping material for roads and pads that do not require a uniform finished surface.

E. Side Barrow

Side barrow material is typically associated with road upgrade and meander within an established road footprint. Gravel materials are excavated along the sides of road footprints in areas where appropriate gravel material deposits exist. Side barrow activities result in wide concave ditches.

Side barrow extraction requires the removal and stockpiling of overburden within a 10' to 20' wide section of ground immediately adjacent to a road base. This is accomplished with a backhoe (Case 235) or excavator (CAT 320). The bucket is extended to the outside reach of the side barrow area and a 6" layer of material scraped inward to load the bucket. Overburden layers are loosely piled outside of the clearing limits. Exposed gravel material is excavated and deposited on the road surface. Once the deposit has been depleted or sufficient gravel has been installed in the immediate section of road, the overburden is spread on top of the excavated area. The overburden is shaped, smoothed and compacted into a wide concave ditch to provide for effective site drainage.

Side barrow deposits are also loaded into end dumps and rock trailers for installation outside of the reach of the backhoe or excavator.

### SC2.1.3 Gravel Pit Reclamation

Gravel pit activities will include a reclamation plan designed to restore or create fish and wildlife habitat. Upland pits not likely to retain any water that are no longer in service are reclaimed by shaping and smoothing exposed areas and spreading and compacting stockpiled overburden. Slopes within a reclaimed pit do not exceed 2:1 and are track-walked (parallel to the pit) for re-seeding and/or fertilizing.

Pits that are in water or are likely to retain water should have reclamation plans that include (1) constructing 20-foot-wide shallow littoral zones (underwater shelves along the bank with slopes no steeper than 1V:10H, (2) constructing irregular shorelines and perhaps islands to maximize the shore-to-water interface, and (3) spreading 2-4 inches of organic materials along the shallow littoral shelf and shoreline to maximize natural revegetation and productivity. Although specific site designs will vary (for example, steeper littoral zones may be necessary along some shorelines), the goal should be to attract a variety of fish and wildlife. Additionally, a 25-foot buffer should be established around most, if not all, of the pond perimeter to help filter sediment and pollutants before they enter the pond.

### SC2.1.4 Guard Rail, Gate, Fencing and Post Installation

Guard rails are installed at bridge crossings, roads with adverse shoulder slopes and along watercourses. Guard rails are installed with a backhoe (Case 235) and include 8" square posts set 4' into the ground with D1 gravel backfill.

Gates, fencing and posts are used to close down an area for the purposes of rehabilitating or repairing an area. The intent is to keep military training and recreationalists out of the area while it is being rehabilitated. Sometime these are used in conjunction with one another; other times posts are use in the middle of a trail or road and act as barriers to entry.

### SC2.1.5 Sign and Seibert Stake Installation

Signs and institutional controls include small reflective aluminum marker signs set on pounded T-posts, wooden two-sided kiosks set in D1 gravel-filled holes and large aluminum signs attached to drill stems and set in D1 gravel-filled holes. Depending on sign dimensions and weight, posts are set 2' - 6' below natural ground surface. Holes are excavated and backfilled by hand shovel.

### SC2.1.6 Soil Stabilization Practices (Permanent)

#### *SC2.1.6.1 Brush Layering*

Brush layering is used to rebuild the streambank. Branches are placed on horizontal benches that follow the contour of the slope and provide reinforcement to the soil. Additional stability is provided when the front of the soil layer is seeded with grass while the woody plants are becoming established. Please note that over-seeding with grass can lead to low success of willows due to competition for water and nutrients.

### *SC2.1.6.2 Land Grading*

Land grading involves reshaping the ground surface to planned grades as determined by an engineering survey, evaluation, and layout. Land grading provides more suitable topography for buildings, facilities, and other land uses and helps to control surface runoff, soil erosion, and sedimentation during and after construction.

### *SC2.1.6.3 Live Bundle (Fascines)*

Fascines are installed along streambanks, water courses and erosive-prone slopes to stabilize soils and prevent bank slope failure. Fascines are effective at controlling erosion and stabilizing slopes immediately after installation and their efficacy improves as the dormant branches sprout and take root. (See Revegetation #20)

### *SC2.1.6.4 Permanent Geotextiles*

Permanent geotextiles are porous fabrics also known as filter fabrics, road rugs, synthetic fabrics, construction fabrics, or simply fabrics. Geotextiles are manufactured by weaving or bonding fibers made from synthetic materials such as polypropylene, polyester, polyethylene, nylon, polyvinyl chloride, glass, and various mixtures of these materials. As a synthetic construction material, geotextiles are used for a variety of purposes such as separators, reinforcement, filtration and drainage, and erosion control.

### *SC2.1.6.5 Permanent Seeding and Planting*

Permanent seeding is used to control runoff and erosion on disturbed areas by establishing perennial vegetative cover from seed. It is used to reduce erosion, to decrease sediment yields from disturbed areas, and to provide permanent stabilization. This practice is economical, adaptable to different site conditions, and allows selection of the most appropriate plant materials.

Permanent seeding is well-suited in areas where permanent, long-lived vegetative cover is the most practical or most effective method of stabilizing the soil. Permanent seeding can be used on roughly graded areas that will not be regraded for at least a year. Vegetation controls erosion by protecting bare soil surfaces from displacement by raindrop impacts and by reducing the velocity and quantity of overland flow. The advantages of seeding over other means of establishing plants include lower initial costs and labor inputs.

Areas to be stabilized with permanent vegetation must be seeded or planted one to four months after the final grade is achieved unless temporary stabilization measures are in place. Successful plant establishment can be maximized with proper planning; consideration of soil characteristics; selection of plant materials that are suitable for the site; adequate seedbed preparation, liming, and fertilization; timely planting; and regular maintenance. Climate, soils, and topography are major factors that dictate the suitability of plants for a particular site. The soil on a disturbed site might require amendments to provide sufficient nutrients for seed germination and seedling growth. The surface soil must be loose enough for water infiltration and root penetration. Soil pH should be between 6.0 and 6.5 and can be increased with liming if soils are too acidic. Seeds can be protected with mulch to retain moisture, regulate soil temperatures, and prevent erosion during seedling establishment.

Depending on the amount of use permanently seeded areas receive, they can be considered high or low maintenance areas. High maintenance areas are mowed frequently, limed and fertilized regularly, and either (1) receive intense use (e.g., athletic fields) or (2) require maintenance to an aesthetic standard (e.g., home lawns). Grasses used for high-maintenance areas are long-lived perennials that form a tight sod and are fine-leaved. High maintenance vegetative cover is used for homes, industrial parks, schools, churches, and recreational areas.

Low maintenance areas are mowed infrequently or not at all and do not receive lime or fertilizer on a regular basis. Plants must be able to persist with minimal maintenance over long periods of time. Grass and legume mixtures are favored for these sites because legumes fix nitrogen from the atmosphere. Sites suitable for low maintenance vegetation include steep slopes, stream or channel banks, some commercial properties, and "utility" turf areas such as road banks.

The effectiveness of permanent seeding can be limited because of the high erosion potential during establishment, the need to reseed areas that fail to establish, limited seeding times depending on the season, and the need for stable soil temperature and soil moisture content during germination and early growth. Permanent seeding does not immediately stabilize soils—temporary erosion and sediment control measures should be in place to prevent off-site transport of pollutants from disturbed areas.

Grasses should emerge within 4–28 days and legumes 5–28 days after seeding, with legumes following grasses. A successful stand should exhibit the following:

- Vigorous dark green or bluish green seedlings, not yellow.
- Uniform density, with nurse plants, legumes, and grasses well intermixed.
- Green leaves—perennials should remain green throughout the summer, at least at the plant bases.

Seeded areas should be inspected for failure, and necessary repairs and reseeding should be made as soon as possible. If a stand has inadequate cover, the choice of plant materials and quantities of lime and fertilizer should be reevaluated. Depending on the condition of the stand, areas can be repaired by overseeding or reseeding after complete seedbed preparation. If timing is bad, rye grain or German millet can be overseeded to thicken the stand until a suitable time for seeding perennials. Consider seeding temporary, annual species if the season is not appropriate for permanent seeding. If vegetation fails to grow, soil should be tested to determine if low pH or nutrient imbalances are responsible.

On a typical disturbed site, full plant establishment usually requires refertilization in the second growing season. Soil tests can be used to determine if more fertilizer needs to be added. Do not fertilize cool season grasses in late May through July. Grass that looks yellow may be nitrogen deficient. Do not use nitrogen fertilizer if the stand contains more than 20% legumes.

Perennial vegetative cover from seeding has been shown to remove between 50 and 100% of total suspended solids from storm water runoff, with an average removal of 90%.

Seeding costs range from $200 to $1,000 per acre and average $400 per acre. Maintenance costs range from 15 to 25% of initial costs and average 20%.

#### *SC2.1.6.6 Sod Stabilization*

Sodding is a permanent erosion control practice that involves laying a continuous cover of grass sod on exposed soils. In addition to stabilizing soils, sodding can reduce the velocity of storm water runoff. Sodding can provide immediate vegetative cover for critical areas and stabilize areas that cannot be vegetated by seed. It also can stabilize channels or swales that convey concentrated flows and can reduce flow velocities.

Sodding is appropriate for any graded or cleared area that might erode, requiring immediate vegetative cover. Locations particularly well-suited to sod stabilization are:

- Residential or commercial lawns and golf courses where prompt use and aesthetics are important.
- Steeply-sloped areas.
- Waterways and channels carrying intermittent flow.
- Areas around drop inlets that require stabilization.

Sodding eliminates the need for seeding and mulching and produces more reliable results with less maintenance. Sod can be laid during times of the year when seeded grasses are likely to fail. The sod must be watered frequently within the first few weeks of installation. The type of sod selected should be composed of plants adapted to site conditions. Sod composition should reflect environmental conditions as well as the function of the area where the sod will be laid. The sod should be of known genetic origin and be free of noxious weeds, diseases, and insects. The sod should be machine cut at a uniform soil thickness of 15 to 25 mm at the time of establishment (this does not include top growth or thatch).

Soil preparation and additions of lime and fertilizer may be needed; soils should be tested to determine if amendments are needed. Sod should be laid in strips perpendicular to the direction of water flow and staggered in a brick-like pattern. The corners and middle of each strip should be stapled firmly. Jute or plastic netting may be pegged over the sod for further protection against washout during establishment. Areas to be sodded should be cleared of trash, debris, roots, branches, stones and clods larger than 2 inches in diameter. Sod should be harvested, delivered, and installed within a period of 36 hours. Sod not transplanted within this period should be inspected and approved prior to its installation.

Compared to seed, sod is more expensive and more difficult to obtain, transport, and store. Care must be taken to prepare the soil and provide adequate moisture before, during, and after installation to ensure successful establishment. If sod is laid on poorly prepared soil or unsuitable surface, the grass will die quickly because it is unable to root. Installed sod that is not adequately irrigated may cause root dieback because grass does not root rapidly and is subject to drying out.

Watering is very important to maintain adequate moisture in the root zone and to prevent dormancy, especially within the first few weeks of installation, until it is fully rooted. Mowing should not result in the removal of more than one-third of the shoot. Grass height should be maintained between 2 and 3 inches. After the first growing season, sod might require additional fertilization or liming. Permanent, fine turf areas require yearly maintenance fertilization. Warm season grass should be fertilized in late spring to early summer, and cool season grass, in late winter and again in early fall.

Sod has been shown to remove up to 99% of total suspended solids in runoff. It is therefore a highly effective management practice for erosion and sediment control, but its trapping efficiency is highly variable depending on hydrologic, hydraulic, vegetation, and sediment characteristics.

#### *SC2.1.6.7 Vegetative Matting*

A vegetative mat is a large transplant of plants with roots and soil intact. Dimensions of the mats vary from one to several feet square and may contain woody and/or herbaceous vegetation. The greatest benefit of this transplanting technique is that vegetative cover is provided immediately after the mat is placed at the new location. The mats often contain many plant species, especially native plants that cannot be obtained elsewhere.

#### *SC2.1.6.8 Willow Live Staking*

Dormant cuttings are the primary plant material used in live staking. Dormant cuttings are harvested from living woody plants in a dormant (not actively growing) state. The cuttings are collected from plants that can root easily, without special treatment, such as certain willow species, poplar and cottonwood.

### *SC2.1.6.9 Water Bars*

Water bars are installed to prevent rill erosion by draining water from the entire width of a roadway with a slope in excess of 5%. They are installed with a road grader (CAT 140G) fitted with a mould board blade and result in a shallow ditch with a parallel berm on the downhill side. The berm is comprised of material excavated from the uphill trench. The berm is installed at a minimum of 12" above the roadway surface with the uphill ditch 6 inches below the road surface. The ditch is typically twice the width of berm. Water bars are spaced at least 10 feet apart, set at 30-45 angles to the road shoulder and connected to side ditches, cutouts or other drainage features.

### *SC2.1.6.10 Grass Lined Channels*

Grass-lined channels convey storm water runoff through a stable conduit. Vegetation lining the channel reduces the flow velocity of concentrated runoff. Grassed channels usually are not designed to control peak runoff loads by themselves and are often used in combination with other best management practices, such as subsurface drains and riprap stabilization.

Where moderately steep slopes require drainage, grassed channels can include excavated depressions or check dams to enhance runoff storage, decrease flow rates, and enhance pollutant removal. Peak discharges can be reduced through temporary detention in the channel. Pollutants can be removed from storm water by filtration through vegetation, by deposition, or in some cases by infiltration of soluble nutrients into the soil. The degree of pollutant removal in a channel depends on the residence time of water in the channel and the amount of contact with vegetation and the soil surface. As a result, removal efficiency is highly dependent on local conditions.

Grassed channels should be used in areas where erosion resistant conveyances are needed, including areas with highly erodible soils and moderately steep slopes (although less than 5%). They should only be installed where space is available for a relatively large cross section. Grassed channels have a limited ability to control runoff from large storms and should not be used in areas where flow rates exceed 5 feet per second.

Grass-lined channels should be sited in accordance with the natural drainage system and should not cross ridges. The channel design should not have sharp curves or significant changes in slope. The channel should not receive direct sedimentation from disturbed areas and should be sited only on the perimeter of a construction site to convey relatively clean storm water runoff. Channels should be separated from disturbed areas by a vegetated buffer or other best management practice to reduce sediment loads.

Basic design recommendations for grassed channels include the following:

- Construction and vegetation of the channel should occur before grading and paving activities begin.
- Design velocities should be less than 5 feet per second.
- Geotextiles can be used to stabilize vegetation until it is fully established.
- Covering the bare soil with sod, mulches with netting, or geotextiles can provide reinforced storm water conveyance immediately.
- Triangular-shaped channels are used with low velocities and small quantities of runoff; parabolic grass channels are used for larger flows and where space is available; trapezoidal channels are used with large flows of low velocity (low slope).
- Outlet stabilization structures should be installed if the runoff volume or velocity has the potential to exceed the capacity of the receiving area.
- Channels should be designed to convey runoff from a 10-year storm without erosion.

- The sides of the channel should be sloped less than 2:1, and triangular-shaped channels along roads should be sloped 2:1 or less for safety.
- All trees, brushes, stumps, and other debris should be removed during construction.

Grass-lined channels can effectively transport storm water from construction areas if they are designed for expected flow rates and velocities and if they do not receive sediment directly from disturbed areas.

Grassed channels, if improperly installed, can alter the natural flow of surface water and have adverse impacts on downstream waters. Additionally, if the design capacity is exceeded by a large storm event, the vegetation might not be sufficient to prevent erosion and the channel might be destroyed. Clogging with sediment and debris reduces the effectiveness of grass-lined channels for storm water conveyance.

Maintenance requirements for grass channels are relatively minimal. During the vegetation establishment period, the channels should be inspected after every rainfall. Other maintenance activities that should be carried out after vegetation is established are mowing, litter removal, and spot vegetation repair. The most important objective in the maintenance of grassed channels is maintaining a dense and vigorous growth of turf. Periodic cleaning of vegetation and soil buildup in curb cuts is required so that water flow into the channel is unobstructed. During the growing season, channel grass should be cut no shorter than the level of design flow.

Costs of grassed channels range according to depth, with a 1.5-foot-deep, 10-foot-wide grassed channel estimated between $6,395 and $17,075 per trench, while a 3.0-foot-deep, 21-foot-wide grassed channel is estimated at $12,909 to $33,404 per trench. Grassed channels can be left in place permanently after the construction site is stabilized to contribute to long-term storm water management. The channels, in combination with other practices that detain, filter, and infiltrate runoff, can substantially reduce the size of permanent detention facilities such as storm water ponds and wetlands, thereby reducing the overall cost of storm water management.

### *SC2.1.6.11 Soil Retention*

Soil retention measures are practices that are used to hold soil in place or to keep it contained within a site boundary. They may include grading or reshaping the ground to lessen steep slopes or shoring excavated areas with wood, concrete, or steel structures. Some soil-retaining measures are used for erosion control, while others are used for protection of workers during construction projects such as excavations.

Grading to reduce steep slopes can be implemented at any construction site by assessing site conditions before breaking ground and reducing steep slopes where possible. Reinforced soil-retaining structures should be used when sites have very steep slopes or loose, highly erodible soils that cause other methods, such as chemical or vegetative stabilization or regrading, to be ineffective. The preconstruction drainage pattern should be maintained to the extent possible.

Continuous Sheeting involves using a material that covers the entire slope continuously, with struts and boards placed along the slope to support the slope face – steel, concrete, or wood should be used as the materials.

Permanent Retaining Walls are concrete masonry or wood (railroad ties) that are left in place after construction is complete in order to provide continued support of the slope.

Skeleton Sheeting is an inexpensive soil bracing system that requires soil to be cohesive and consists of construction grade lumber being used to support the excavated face of a slope.

The proper design of reinforced soil retaining structures is crucial for erosion control and safety. To ensure safety of the retaining structure, it should be designed by a qualified engineer who understands all of the design considerations, such as the nature of the soil, location of the groundwater table, and the expected loads. Care should be taken to ensure that hydraulic pressure does not build up behind the retaining structure and cause failure.

To be effective, soil retention structures must be designed to handle expected loads. However, heavy rains or mass wasting may damage or destroy these structures and result in sediment inputs to water bodies. They must be properly installed and maintained to avoid failure.

Soil stabilization structures should be inspected periodically, particularly after rainstorms, to check for erosion, damage, or other signs of deterioration. Any damage to the actual slope or ditch, such as washouts or breakage, should be repaired prior to any reinstallation of the materials for the soil stabilization structure.

Soil retention structures, if properly designed and installed, can effectively prevent erosion and mass wasting in areas with steep slopes and erodible soils. Their potential for failure depends on their design, installation, maintenance, and the likelihood of catastrophic events such as heavy rains, earthquakes, and landslides.

Slope reduction can be accomplished during site development and might not incur any additional costs. Soil stabilization structures can be expensive because they require a professional engineer to develop a design (estimated to be 25 to 30% of construction costs. Depending on the size of the proposed structure and the relief of the surrounding area, excavation and installation costs might be high. Capital costs include mobilization, grading, grooving, tracking and compacting fill, and installing the structures. Labor costs for regular inspection and repairs are also a consideration.

#### *SC2.1.6.12 Spruce Tree Revetment*
Spruce tree revetments consist of whole spruce trees laid parallel to the streambank and are installed to provide immediate erosion control and bank protection. The trees are secured tightly to the bank with cable and earth anchors and preferably to the streambed below the water level. Tree tops are pointed downstream and overlapped a minimum of 30% of the whole tree length. Care should be taken to avoid unnecessary damage to, or removal of, tree limbs. (See Alaska Streambank Repair #27)

#### *SC2.1.6.13 Root Wads*
Root wads are a streambank protection technique that provides immediate riverbank stabilization, protects the toe of slope and provides excellent fish habitat, especially for juvenile fish. Root wads are particularly well suited for higher velocity river systems and riverbanks which are severely eroded. They provide toe support for bank revegetation techniques and collect sediment and debris that will enhance bank structure over time. The root fan of the structure is placed in a dredged channel parallel to the toe of the bank streambed elevation. The bole of the tree is securely anchored and set into the bank (often the existing bank is removed and backfilled over the boles). The boles are placed close enough so the root fans overlap.

#### *SC2.1.6.14 Vegetative Buffer*
Vegetated buffers are areas of either natural or established vegetation that are maintained to protect the water quality of neighboring areas. Buffer zones reduce the velocity of storm water runoff, provide an area for the runoff to permeate the soil, contribute to groundwater recharge, and act as filters to catch sediment. The reduction in velocity also helps to prevent soil erosion, catch sediment and toxic chemicals (e.g., pesticides, fertilizers).

Vegetated buffers can be used in any area that is able to support vegetation, but they are most effective and beneficial on floodplains, near wetlands, along streambanks, and on steep, unstable slopes. They are also effective in separating land use areas that are not compatible and in protecting wetlands or water bodies by displacing activities that might be potential sources of non-point source pollution.

To establish an effective vegetative buffer, the following guidelines should be followed:

- Soils should not be compacted.
- Slopes should be less than 5%.
- Buffer widths should be determined after careful consideration of slope, vegetation, soils, depth to impermeable layers, runoff sediment characteristics, type and quantity of storm water pollutants, annual rainfall, and primary land use of adjacent property.
- Buffer widths should increase as slope increases.
- Zones of vegetation (native vegetation in particular), including grasses, deciduous and evergreen shrubs, and understory and overstory trees, should be intermixed.
- In areas where flows are concentrated and velocities are high, buffer zones should be combined with other structural or nonstructural best management practices as a pretreatment.

Vegetated buffers require plant growth before they can be effective, and land on which to plant the vegetation must be available. If the cost of the land is very high, buffer zones might not be cost effective. Although vegetated buffers help to protect water quality, they usually do not effectively counteract concentrated storm water flows to neighboring or downstream wetlands.

Inspection and maintenance are most important when buffer areas are first installed. Once established, vegetated buffers do not require much maintenance beyond the routine procedures listed earlier and periodic inspections of the areas, especially after any heavy rainfall and at least once a year. Inspections should focus on encroachment, gully erosion, density of vegetation, evidence of concentrated flows through the areas, and any damage from foot or vehicular traffic. If there is more than 6 inches of sediment in one place, it should be removed.

Several researchers have measured greater than 90% reductions in sediment and nitrate concentrations. Buffer/filter strips do a reasonably good job of removing phosphorus attached to sediment but are relatively ineffective in removing dissolved phosphorus.

### *SC2.1.6.15 Retention ponds*

Wet ponds (a.k.a., storm water ponds, retention ponds, wet extended detention ponds) are constructed basins that have a permanent pool of water throughout the year (or at least throughout the wet season). Ponds treat incoming storm water runoff by settling and algal uptake. The primary removal mechanism is settling as storm water runoff resides in this pool, and pollutant uptake, particularly of nutrients, also occurs through biological activity in the pond.

### *SC2.1.6.16 Detention ponds (including wet ponds)*

Wet detention ponds are storm water control structures providing both retention and treatment of contaminated storm water runoff. The pond consists of a permanent pool of water into which storm water runoff is directed. Runoff from each rain event is detained and treated in the pond until it is displaced by runoff from the next storm.

### *SC2.1.6.17 Infiltration Measures*

Infiltration measures can include drainfields that are designed to promote storm water infiltration into subsoils. These drainfields help to control runoff and prevent the contamination of local watersheds. The system is usually composed of a pretreatment structure, a manifold system, and a drainfield.

### *SC2.1.6.18 Open Vegetated Swales*

The term swale (a.k.a., grassed channel, dry swale, wet swale, biofilter) refers to a series of vegetated, open channel management practices designed specifically to treat and attenuate storm water runoff for a specified water quality volume. As storm water runoff flows through these channels, it is treated through filtering by the vegetation in the channel, filtering through a subsoil matrix, and/or infiltration into the underlying soils. Variations of the grassed swale include the grassed channel, dry swale, and wet swale.

### *SC2.1.6.19 Natural Depression*

Natural depressions are naturally occurring areas where storm water runoff can settle.

## SC2.1.7 Soil Stabilization Practices (Temporary)

### *SC2.1.7.1 Buffer Zones*

Buffer zones are vegetated strips of land used for temporary or permanent water quality benefits. Buffer zones are used to decrease the velocity of storm water runoff, which in turn helps to prevent soil erosion. Buffer zones are different from vegetated filter strips because buffer zone effectiveness is not measured by its ability to improve infiltration (allow water to go into the ground). The buffer zone can be an area of vegetation that is left undisturbed during construction, or it can be newly planted.

Buffer zones techniques can be used at any site that can support vegetation. Buffer zones are particularly effective on floodplans, next to wetlands, along streambanks, and on steep, unstable slopes.

If buffer zones are preserved, existing vegetation, good planning, and site management are needed to protect against disturbances such as grade changes, excavation, damage from equipment, and other activities. Establishing new buffer strips requires the establishment of a good dense turf, trees, and shrubs. Careful maintenance is important to ensure healthy vegetation. The need for routine maintenance such as mowing, fertilizing, liming, irrigating, pruning, and weed and pest control will depend on the species of plants and trees involved, soil types, climatic conditions and location. Maintaining planted areas may require debris removal and protection against unintended uses or traffic.

### *SC2.1.7.2 Mulching*

Mulching is a temporary erosion control practice in which materials such as grass, hay, wood chips, wood fibers, straw, or gravel are placed on exposed or recently planted soil surfaces. Mulching is highly recommended as a stabilization method and is most effective when used in conjunction with vegetation establishment. In addition to stabilizing soils, mulching can reduce storm water runoff velocity. When used in combination with seeding or planting, mulching can aid plant growth by holding seeds, fertilizers, and topsoil in place, preventing birds from eating seeds, retaining moisture, and insulating plant roots against extreme temperatures.

Mulch mattings are materials such as jute or other wood fibers that are formed into sheets and are more stable than loose mulch. Jute and other wood fibers, plastic, paper, or cotton can be used individually or combined into mats to hold mulch to the ground. Netting can be used to stabilize soils while plants are growing, although netting does not retain moisture or insulate against extreme temperatures. Mulch binders consist of asphalt or synthetic materials that are sometimes used instead of netting to bind loose mulches.

Mulching is often used in areas where temporary seeding cannot be used because of environmental constraints. Mulching can provide immediate, effective, and inexpensive erosion control. On steep slopes and critical areas such as waterways, mulch matting is used with netting or anchoring to hold it in place.

Mulches can be used on seeded and planted areas where slopes are steeper than 2:1 or where sensitive seedlings require insulation from extreme temperatures or moisture retention.

When possible, organic mulches should be used for erosion control and plant material establishment. Suggested materials include loose straw, netting, wood cellulose, or agricultural silage. All materials should be free of seed, and loose hay or straw should be anchored by applying tackifier, stapling netting over the top, or crimping with a mulch crimping tool. Materials that are heavy enough to stay in place (for example, gravel or bark or wood chips on flat slopes) do not need anchoring. Other examples include hydraulic mulch products with 100% post-consumer paper content, yard trimming composts, and wood mulch from recycled stumps and tree parts. Inorganic mulches such as pea gravel or crushed granite can be used in unvegetated areas.

Mulches may or may not require a binder, netting, or tacking. Effective use of netting and matting material requires firm, continuous contact between the materials and the soil. If there is no contact, the material will not hold the soil and erosion will occur underneath the material. Grading is not necessary before mulching.

There must be adequate coverage to prevent erosion, washout, and poor plant establishment. If an appropriate tacking agent is not applied, or is applied in insufficient amounts, mulch is lost to wind and runoff. The channel grade and liner must be appropriate for the amount of runoff, or there will be resulting erosion of the channel bottom. Also, hydromulch should be applied in spring, summer, or fall to prevent deterioration of mulch before plants can become established. Table SC2.3 presents guidelines for installing mulches.

Table SC2.3. Typical mulching materials and application rates.

| **Material** | **Rate per Acre** | **Requirements** | **Notes** |
|---|---|---|---|
| *Organic Mulches* | | | |
| Straw | 1 - 2 tons | Dry, unchopped, unweathered; avoid weeds. | Spread by hand or machine; must be tacked or tied down. |
| Wood fiber or wood cellulose | ½ - 1 ton | | Use with hydroseeder; may be used to tack straw. Do not use in hot, dry weather. |
| Wood chips | 5 - 6 tons | Air dry. Add fertilizer N, 12 lb/ton. | Apply with blower, chip handler, or by hand. Not for fine turf areas. |
| Bark | 35 $yd^3$ | Air dry, shredded, or hammermilled, or chips | Apply with mulch blower, chip handler, or by hand. Do not use asphalt tack. |

| | | | |
|---|---|---|---|
| *Nets and Mats* | | | |
| Jute net | Cover area | Heavy, uniform; woven of single jute yarn. Used with organic mulch. | Withstands water flow. |
| Excelsior (wood fiber) mat | Cover area | | |
| Fiberglass roving | ½ - 1 ton | Continuous fibers of drawn glass bound together with a non-toxic agent. | Apply with compressed air ejector. Tack with emulsified asphalt at a rate of 25 - 35 gal./1000 $ft.^2$ |

Mulching, matting, and netting might delay seed germination because the cover changes soil surface temperatures. The mulches themselves are subject to erosion and may be washed away in a large storm. Maintenance is necessary to ensure that mulches provide effective erosion control and are removed when protection is no longer needed and disposed of in a landfill or composted. Mulched areas should be inspected frequently to identify areas where mulch has loosened or been removed, especially after rainstorms. Such areas should be reseeded (if necessary) and the mulch cover replaced immediately. Mulch binders should be applied at rates recommended by the manufacturer. If washout, breakage, or erosion occurs, surfaces should be repaired, reseeded, and remulched, and new netting should be installed. Inspections should continue until vegetation is firmly established.

Mulching effectiveness varies according to the type of mulch used. Soil loss reduction for different mulches ranges from 53 to 99.8%. Water velocity reductions range from 24 to 78%. Table SC2.4 shows soil loss and water velocity reductions for different mulch treatments.

Table SC2.4. Measured reductions in soil loss for different mulch treatments.

| **Mulch Characteristics** | **Soil Loss Reduction (%)** | **Water Velocity Reduction (% relative to bare soil)** |
|---|---|---|
| 100% wheat straw/top net | 97.5 | 73 |
| 100% wheat straw/two nets | 98.6 | 56 |
| 70% wheat straw/30% coconut fiber | 98.7 | 71 |
| 70% wheat straw/30% coconut fiber | 99.5 | 78 |
| 100% coconut fiber | 98.4 | 77 |
| Nylon monofilament/two nets | 99.8 | 74 |
| Nylon monofilament/rigid/bonded | 53.0 | 24 |
| Vinyl monofilament/flexible/bonded | 89.6 | 32 |
| Curled wood fibers/top net | 90.4 | 47 |
| Curled wood fibers/two nets | 93.5 | 59 |
| Antiwash netting(jute) | 91.8 | 59 |
| Interwoven paper and thread | 93.0 | 53 |
| Uncrimped wheat straw, 2,242 kg/ha | 84.0 | 45 |
| Uncrimped wheat straw, 4,484 kg/ha | 89.3 | 59 |

In addition, mulching provides a high rate of sediment and nutrient pollution prevention. This study also found that seeding or mulching added value to a site in the eyes of the developers, real estate agents, and homebuyers that more than offset the cost of seeding or mulching.

### *SC2.1.7.3 Temporary Geotextiles*

Geotextiles are porous fabrics also known as filter fabrics, road rugs, synthetic fabrics, construction fabrics, or simply fabrics. Geotextiles are manufactured by weaving or bonding fibers made from synthetic materials such as polypropylene, polyester, polyethylene, nylon, polyvinyl chloride, glass, and various mixtures of these materials. As a synthetic construction material, geotextiles are used for a variety of purposes such as separators, reinforcement, filtration and drainage, and erosion control. Some geotextiles are made of biodegradable materials such as mulch matting and netting. Mulch mattings are jute or other wood fibers that have been formed into sheets and are more stable than normal mulch. Netting is typically made from jute, wood fiber, plastic, paper, or cotton and can be used to hold the mulching and matting to the ground. Netting can also be used alone to stabilize soils while the plants are growing; however, it does not retain moisture or temperature well. Mulch binders (either asphalt or synthetic) are sometimes used instead of netting to hold loose mulches together. Geotextiles can aid in plant growth by holding seeds, fertilizers, and topsoil in place. Fabrics are relatively inexpensive for certain applications. A wide variety of geotextiles exist to match the specific needs of the site.

Geotextiles can be used alone for erosion control. Geotextiles can be used as matting to stabilize the flow of channels or swales or to protect seedlings on recently planted slopes until they become established. Matting may be used on tidal or streambanks, where moving water is likely to wash out new plantings. They can also be used to protect exposed soils immediately and temporarily, such as when active piles of soil are left overnight. Geotextiles are also used as separators; for example, as a separator between riprap and soil. This "sandwiching" prevents the soil from being eroded from beneath the riprap and maintains the riprap's base.

There are many types of geotextiles available. Therefore, the selected fabric should match its purpose. State or local requirements, design procedures, and any other applicable requirements should be considered. Effective netting and matting require firm, continuous contact between the materials and the soil. If there is no contact, the material will not hold the soil, and erosion will occur underneath the material.

Geotextiles (primarily synthetic types) have the potential disadvantage of being sensitive to light and must be protected prior to installation. Some geotextiles might promote increased runoff and might blow away if not firmly anchored. Depending on the type of material used, geotextiles might need to be disposed of in a landfill, making them less desirable than vegetative stabilization. If the fabric is not properly selected, designed, or installed, the effectiveness may be reduced drastically.

Regular inspections should be made to determine if cracks, tears, or breaches have formed in the fabric; if so, it should be repaired or replaced immediately. It is necessary to maintain contact between the ground and the geotextile at all times. Trapped sediment should be removed after each storm event.

Geotextiles' effectiveness depends upon the strength of the fabric and proper installation. For example, when protecting a cut slope with a geotextile, it is important to properly anchor the fabric. This will ensure that it will not be undermined by a storm event.

#### *SC2.1.7.4 Temporary Seeding*

Temporary seeding means growing a short-term vegetative cover (plants) on a disturbed site areas that may be in danger of erosion. The purpose of temporary seeding is to reduce erosion and sedimentation by stabilizing disturbed areas that will not be stabilized for long periods of time or where permanent plant growth is not necessary or appropriate. This practice uses fast-growing annual or short-lived perennial grasses whose root systems hold down the soils so that they are less apt to be carried off-site by storm water runoff or wind. Temporary seeding also reduces the problems associated with mud and dust from bare soil surfaces during construction.

Temporary seeding should be performed on areas which have been disturbed by construction and are likely to be redisturbed, but not for several weeks or more. Typical areas might include denuded areas, soil stockpiles, dikes, dams, sides of sediment basins, and temporary roadbanks. Temporary seeding should take place as soon as practicable after the last land-disturbing activity in an area.

Proper seed bed preparation and the use of high quality seed are needed to grow plants for effective erosion control. Soil that has been compacted by heavy traffic or machinery may need to be loosened. Successful growth usually requires that the soil be tilled before the seed is applied. Topsoiling is not necessary for temporary seeding; however, it may improve the chances of establishing temporary vegetation in an area. Seed bed preparation may also require applying fertilizer and/or lime to the soil to make conditions more suitable for plant growth. Proper fertilizer, seeding mixtures, and seeding rates vary depending on the location of the site, soil types, slopes, and season.

Seeded areas should be covered with mulch to provide protection from the weather. Seeding on slopes of 2:1 or more, in adverse soil conditions, during excessively hot or dry weather, or where heavy rain is expected should be followed by spreading mulch. Frequent inspections are necessary to check that conditions for growth are good. If the plants do not grow quickly or thick enough to prevent erosion, the area should be reseeded as soon as possible. Seeded areas should be kept adequately moist. If normal rainfall will not be enough, mulching, matting, and controlled watering should be done. If seeded areas are watered, watering rates should be watched so that over-irrigation (which can cause erosion itself) does not occur.

#### *SC2.1.7.5 Soil Roughening*

Soil roughening is a temporary erosion control practice often used in conjunction with grading. Soil roughening involves increasing the relief of a bare soil surface with horizontal grooves, stair-stepping (running parallel to the contour of the land), or tracking using construction equipment. Slopes that are not fine graded and that are left in a roughened condition can also reduce erosion. Soil roughening reduces runoff velocity, increases infiltration, reduces erosion, traps sediment, and prepares the soil for seeding and planting by giving seed an opportunity to take hold and grow.

Soil roughening is appropriate for all slopes. Soil roughening works well on slopes greater than 3:1, on piles of excavated soil, and in areas with highly erodible soils. This technique is especially appropriate for soils that are frequently mowed or disturbed because roughening is relatively easy to accomplish. To slow erosion, roughening should be done as soon as possible after the vegetation has been removed from the slope. Roughening can be used with both seeding and planting and temporary mulching to stabilize an area. For steeper slopes and slopes that will be left roughened for longer periods of time, a combination of surface roughening and vegetation is appropriate. Roughening should be performed immediately after grading activities have ceased (temporarily or permanently) in an area.

Rough slope surfaces are preferred because they aid the establishment of vegetation, improve infiltration, and decrease runoff velocity. Graded areas with smooth, hard surfaces might seem appropriate, but such surfaces may increase erosion potential. A rough soil surface allows surface ponding that protects lime, fertilizer, and seed. Grooves in the soil are cooler and provide more favorable moisture conditions than hard, smooth surfaces. These conditions promote seed germination and vegetative growth.

It is important to avoid excessive compacting of the soil surface, especially when tracking, because soil compaction inhibits vegetation growth and causes higher runoff velocity. Therefore, it is best to limit roughening with tracked machinery to sandy soils that do not compact easily and to avoid tracking on heavy clay soils, particularly when wet. Roughened areas should be seeded as quickly as possible. Proper dust control procedures also should be followed when soil roughening.

There are different methods for achieving a roughened soil surface on a slope. The selection of an appropriate method depends on the type of slope and the available equipment. Roughening methods include stair-step grading, grooving, and tracking. Factors to consider when choosing a method are slope steepness, mowing requirements, whether the slope is formed by cutting or filling, and available equipment. The following methods can be used for surface roughening.

*Cut slope roughening for areas that will not be mowed.* Stair-step grades or groove-cut slopes should be used for gradients steeper than 3:1. Stair-step grading should be used on any erodible material that is soft enough to be ripped with a bulldozer. Slopes consisting of soft rock with some subsoil are particularly suited to stair-step grading. The vertical cut distance should be less than the horizontal distance, and the horizontal portion of the step should be slightly sloped toward the vertical wall. Individual vertical cuts should not be made more than 2 feet deep in soft materials or more than 3 feet deep in rocky materials.

*Grooving*. This technique uses machinery to create a series of ridges and depressions that run across the slope along the contour. Grooves should be made using any appropriate implement that can be safely operated on the slope, such as disks, tillers, spring harrows, or the teeth on a front-end loader bucket. The grooves should be made more than 3 inches deep and less than 15 inches apart.

*Fill slope roughening for areas that will not be mowed*. Fill slopes with a gradient steeper than 3:1 should be placed in lifts less than 9 inches, and each lift should be properly compacted. The face of the slope should consist of loose, uncompacted fill 4 to 6 inches deep. Grooving should be used as described above to roughen the face of the slopes, if necessary. The final slope face should not be bladed or scraped.

*Cuts, fills, and graded areas that will be mowed.* Mowed slopes should be made no steeper than 3:1. These areas should be roughened with shallow grooves less than 10 inches apart and more than 1 inch deep using normal tilling, disking, or harrowing equipment (a cultipacker-seeder can also be used). Excessive roughness is undesirable where mowing is planned.

*Roughening with tracked machinery.* Roughening with tracked machinery should be limited to sandy soils to avoid undue compaction of the soil surface. Tracked machinery should be operated perpendicular to the slope to leave horizontal depressions in the soil. Tracking is generally not as effective as other roughening methods.

Soil roughening is not appropriate for rocky slopes. Soil compaction might occur when roughening with tracked machinery. Soil roughening is of limited effectiveness in anything more than a gentle or shallow depth rain. If roughening is washed away in a heavy storm, the surface will have to be re-roughened and new seed laid.

Areas need to be inspected after storms, since roughening might need to be repeated. Regular inspection of roughened slopes will indicate where additional erosion and sediment control measures are needed. If rills (small watercourses that have steep sides and are usually only a few inches deep) appear, they should be filled, graded again, and reseeded immediately. Proper dust control methods should be used.

Soil roughening provides moderate erosion protection for bare soils while vegetative cover is being established. It is inexpensive and simple for short-term erosion control when used with other erosion and sediment controls.

### *SC2.1.7.6 Temporary Storm Drain Diversion*
Temporary storm drain diversions are storm drain pipes or temporary berms which redirect an existing storm drain system or outfall channel to discharge into a sediment trap or basin.

### *SC2.1.7.7 Chemical Stabilization*
Chemical stabilizers, also known as soil binders or soil palliatives, provide temporary soil stabilization. Materials made of vinyl, asphalt, or rubber are sprayed onto the surface of exposed soils to hold the soil in place and protect against erosion from runoff and wind. Chemicals used for stabilization are easily applied to the surface of the soil, can be effective in stabilizing areas where vegetative practices cannot be established, and provide immediate protection.

Chemical stabilization can be used in areas where other methods of stabilization, such as temporary seeding or permanent vegetation, are not effective because of environmental constraints. They can also be used in combination with vegetative or perimeter practices to enhance erosion and sediment control.

The application rates and procedures recommended by the manufacturer of a chemical stabilization product should be followed as closely as possible to prevent the products from forming ponds and to avoid creating impervious areas where storm water cannot infiltrate.

Chemical stabilization can create impervious surfaces where water cannot infiltrate and which might increase storm water runoff. Overuse of chemical stabilizers might adversely affect water quality, although the chemicals' impacts on wildlife are still unknown. Additionally, chemical stabilization is usually more expensive than vegetative practices.

Chemically stabilized areas should be regularly inspected for signs of erosion. Stabilizers should be reapplied if necessary.

Effectiveness of polymer stabilization methods ranges from 70% to 90%, although effectiveness of a particular polymer depends on soil type, application method, and individual chemical characteristics of the polymer.

## SC2.2 Vegetation Management

The following section details the standard procedures used for vegetation management on USAG-AK lands. These procedures include biological and chemical controls, prescribed burning, revegetation, and mechanical and hand vegetation cutting and clearing.

### SC2.2.1 Biological and Chemical Controls

#### *SC2.2.1.1 Biological and Chemical Controls*

For wetland restoration, biological control and chemical control are carried out to insure that a practice functions as intended throughout its expected life. These actions include normal repetitive activities in the application and use of the practice (operation), and repair and upkeep of the practice (maintenance). These controls are used to control undesirable plant species and pests (e.g., using predator or parasitic species) is implemented where available and feasible.

#### *SC2.2.1.2 Water/Chemical Suppression*

Chemicals can also be used for soil stabilization practices, often referred to as chemical mulch, soil binder, or soil palliative, and are temporary erosion control practices. Materials made of vinyl, asphalt, or rubber are sprayed onto the surface of the soil to hold the soil in place and protect against erosion from storm water runoff and wind. Many of the products used for chemical stabilization are human-made, and many different products are on the market.

### SC2.2.2 Prescribed Burning

Prescribe burning consists of the following procedures. A burn plan is prepared and detailed parameters are identified for when burning can take place. When the burn prescription window is open, crews assemble at the burn unit. The edge of the burn unit is lit using hand lighting or aerial lighting techniques. The units are surrounded by roads, trails or changes in vegetation types, and these are used to burn off of. Next the interior of the unit is lit using hand lighting or aerial lighting techniques. The interior is lit using systematic girding patterns. After the entire unit is lit, the mop-up process starts. Mop-up consists of extinguishing all hot spots within a specified distance from the burn perimeter. During mop-up, burning trees and shrubs are cut down and extinguished. Smoldering sites are dug up with hand tools and extinguished. Water is applied on an as-needed basis during mop-up either by backpack pumps, draft pumps, fire engines, or helicopter buckets. The final process involves monitoring the burn unit until the fire is completely out; this process can take anywhere from several days to several months. The Bureau of Land Management, Alaska Fire Service, State of Alaska, Division of Forestry, or the USAG-AK Fire Department working with the USAG-AK Natural Resource Office prepare burn plans and implement prescribed fires.

Fire management practices, including suppression and prescribed burning, are designed to implement the land management policies. Prescribed fires are used for silvicultural treatment of sites, preparation for reforestation, hazard fuel reduction, habitat enhancement, and insect and disease control. Prescribe fires are also used as a tool to reduce fuel loading on ranges where the risk of wildfire limits military training opportunities. Wildland fire escapement from impact areas are reduced through prescribed fires and mechanical treatments along the boundaries of impact areas.

### SC2.2.3 Revegetation

Re-vegetation practices are installed to prevent erosion, stabilize soils and restore native flora and include a variety of plant and seed based practices.

#### *SC2.2.3.1 Seeding*

Seeding exposed soils is the most common re-vegetation activity on USAG-AK lands. Effective seeding requires appropriate timing and weather conditions. Seeding is installed prior to August 1$^{st}$ to allow for adequate root growth for successful over-wintering. Adequate moisture is required for all seeding installations. Seeding typically occurs just prior to imminent or forecasted precipitation. If adequate moisture is not present or predicted, water is applied to the project site by a water truck or tanker. Seeds are hand broadcast in small seeding areas. Large areas are seeded with tractor (John Deere 4020)-pulled Brillion-type grass seeder.

I. Type

Native type seed mixes are used whenever appropriate. These mixes often include a single non-native annual (i.e. annual rye) with an accelerated emergence as a “quick” cover, allowing for the protection of native seed and there slower germination. These annuals are not persistent and typically disappear from the stand within two to three years.

Native seed mix recommendations and installation requirements practices are developed using the University of Alaska, Fairbanks, Cooperative Extension Service’s “A Revegetative Guide for Conservation Use in Alaska.”

The most common native seeds used on USAG-AK lands are Wainwright wheatgrass, arctared red fescue, sourdough bluejoint reedgrass and nortran tufted hairgrass.

II. Seed Bed Preparation

Seed beds are prepared by hand and heavy equipment. Small seeding areas are raked by hand or track walked with a dozer (CAT D4 –D6). Large areas are tracked by a dozer or raked by a pulled light tine harrow. Rake, track and harrow indentation are installed perpendicular to the prevailing winds or downhill slope. Indentations are effective at holding seed, fertilizer and moisture for improved germination.

#### *SC2.2.3.2 Fertilizing*

The application of commercial chemical fertilizer, consisting of nitrogen, phosphorous, potassium and sulfur, is an essential component of effective revegetation. Fertilizer is applied to small areas with regulated hand broadcasters. Large area application requires a bulk fertilizer spreader pulled by a tractor (John Deere 4020).

Fertilizer mix and application rates are determined by seed mix, soil type and season. Fertilizer is applied to planted ground and exposed soils with local sources of native seed.

#### *SC2.2.3.3 Live Staking*

Dormant cuttings are the primary plant material used in live staking. Dormant cuttings are harvested from living woody plants in a dormant (not actively growing) state. The cuttings are collected from plants that can root easily without special treatment, such as certain willow species, poplar and cottonwood.

Live staking will be implemented to install the dormant cutting directly into the ground. This technique is often utilized where single stem plantings will provide adequate plant cover, slope stability and fish habitat.

Several live stakes can be prepared from one dormant cutting. Stakes should be cut as long as possible, ¼ to ½ inches in diameter (slightly larger diameter cuttings will also work). Discard flower buds ("pussy willows"). Flower buds typically occur at the top 2/3 of a branch that was produced during the past growing season. At least one or two leaf buds, which are smaller than flower buds, must be present near the top of each live stake.

Use rebar, ½ inch or less in diameter, to create a planting hole for longer stakes, particularly when planting in compact and gravelly soils. Tightly pack the soil around the stake so that no air pockets remain.

Plant stakes upright 1 to 3 feet on center. Stakes should be planted as vertically as possible, placing at least ¾ of the stake below ground so that only one or two leaf buds are left exposed above the ground. The intent is to maximize the surface area for rooting so a good root system can develop and support a healthy shoot system. If more than one or two buds, ¼ of the stake, or 4 inches of the live stake is extending above the soil surface, trim the stake.

The contractor will water the live stakes during the re-vegetation process to help remove air pockets and increase contact between the soil and surface of the live stake. Moist soil is needed during the period the live stake is rooting and becoming established. Topsoil is not required. Survival rates for drier sites may be increased if larger cuttings are used.

Willow harvest sites need to be identified and permission obtained to collect cuttings. Harvest sites are easier to identify when leaves are present. Collect cuttings during winter/early spring before leaves appear, preferably before March 31, if they are to be used for spring and early summer plantings. For fall plantings, collect cuttings in the late summer/early fall, after plants have gone dormant and the leaves have changed color or have dropped. Select cuttings with leaf buds near the top of each cut line. Avoid flower buds ("pussy willows") if possible; these buds typically occur at the tips of branches produced during the last growing season. These branch tips tend to be smaller than ¼ inch in diameter. Select branches ¼ to 2 inches in diameter and at least 3 to 4 feet long. If necessary, branches can be cut to a shorter length at the time of installation. The potential for drying during storage is reduced when the cuttings are stored in longer pieces.

Cuttings need to be stored to maintain viability. If collection occurs while daytime temperatures remain below freezing, freeze or refrigerate the cuttings until planting. If daytime temperatures are above freezing during collection, cuttings should be refrigerated. Frozen cuttings can be stored with a small amount of snow to help reduce drying. Refrigerated cuttings should be stored at 31° F to 40° F and 60 to

70% humidity. Monitor the condition of the cuttings regularly to detect problems such as drying, sprouting or mold.

Take cuttings directly from cold storage to the planting site. Only the plant material required for each day should be removed from storage, particularly if the weather is windy and/or warm. On site, the cuttings should be stored away from direct sunlight, heeled into moist soil, or stored in water until planting.

Plant dormant cuttings as soon as the soil has thawed and no later than July 1, or plant in late summer/fall before the ground freezes. The ability of plantings to become established and resume growth the following spring declines quickly for plantings made after July 1. If the project is delayed and rescheduled for fall, do not try to store the cuttings that were collected in the spring until fall. You should plan on preparing new cuttings once the plants have gone dormant.

Collect different species of woody cuttings that root easily and can be mixed in the layers; rooted plants can also be added to create a hedge-brush layer. If the brush layer is installed below the ordinary high water level, branches from alders and willows that do not root readily may be used, since these plant layers probably will not survive and become established, living plants.

#### *SC2.2.3.4 Fascines*

Facines are installed along streambanks, water courses and erosive prone slopes to stabilize soils and prevent bank slope failure. Fascines are effective at controlling erosion and stabilizing slopes immediately after installation, and their efficacy improves as the dormant branches sprout and take root.

Fascines are comprised of tightly wrapped bundles of dormant felt leaf willow. Bundles are typically 12” to 24” in diameter and wrapped with a biodegradable twine. The bundles are installed into a trench slightly wider than the bundle diameter. Trenches are excavated by a backhoe (Case 235) or hand shovel. Fascines are buried to a depth 2/3 of the bundle height and staked to the ground with wood wedge stakes. Excavated soil is placed on top of the fascine and walked down into the bundle to fill voids between branches and promote stem budding through soil contact. Fascines are laid parallel to surface water flows and act as water bars. Fascine spacing is dependant on slope, soil type and predicted surface flows.

### SC2.2.4 Vegetation Cutting and Clearing (Mechanical)

Tree clearing is conducted by hand and machine. Trees are removed within a specific area and cut to length and piled for personal firewood harvest, piled and burned, chipped and spread out, or buried on site. Any clearing in wetlands that disturbs the soil, especially masticating, requires a Section 404 Clean Water Act permit from the U.S Army Corps of Engineers Regulatory Branch.

Trees are typically cut, ground or sheared to ground level with minimal to moderate intrusion into mineral soil. Some tree thinning operations require the use of a dozer, which can result in the removal of the root balls and associated soil. Most mechanical clearing operations are conducted on frozen soil conditions. When clearing or cutting near water bodies, it is necessary to maintain a riparian buffer zone if possible.

#### *SC2.2.4.1 Mechanical Thinning*

Mechanical thinning is conducted with a feller buncher (cut), an excavator (CAT 320) with a thumb attachment (pull), or a hydro-axe (grind). Specific areas of trees are removed by cutting, grinding or pulling. Mechanical clearing typically involves large areas and wide spacings. Mechanical thinning operations are conducted in hazardous fuel reduction, maneuver corridor and training facility line-of-sight projects.

*SC2.2.4.2 Mechanical Clearing*

Mechanical clearing is conducted with a feller buncher (cut), a dozer fitted with a straight or shear blade (shear) or a hydro-axe (grind). Specific areas of trees are removed by cutting, grinding or shearing. Mechanical clearing typically involves large areas and wide spacings. Mechanical thinning operations are conducted in hazardous fuel reduction, maneuver corridor and training facility line-of-sight projects.

I. Shear Blade

Shear blades (Rome KG) are fitted to the front of large dozers (CAT D8 or larger) and consist of a curved face with a flat cutting edge that rides on the ground surface. Shearblades are used to cut off trees and vegetation at the ground surface in a spiral pattern during frozen soil conditions. Sheared material is rolled into windrows. Shearblades allow for effective stem and trunk cutting with minimal root ball and soil disturbance. Shearbladed material can be left to decompose or piled and burned.

Shearblading is performed on hazardous fuel reduction, fire break and wildlife food plot projects.

II. Straight Blade

Straight blades are fitted to the front of small to large sized dozers (CAT D4-D9) and are used to shear trees and surface organics into piles during clearing operations. Straight blades are used on frozen soil conditions when soil intrusion is an issue. Straight blades are also used for material piling during burning operations.

III. Hydro-axe (Masticating)

A masticating head hydro-axe (Fecon) is used to grind whole trees and woody vegetation into small chip-like residue. Masticating heads are rotating cylinders with offset rows of teeth and can be used to grind to ground surface or deeper. Sub-surface grinding incorporates wood material into the soil. Masticating hydro-axe work is performed during frozen and non-frozen soil conditions, depending on soil type and ground moisture. Masticating hydro-axes are used in hazardous fuel reduction, fire break, line-of-sight and roadside clearing projects.

IV. Hydro-axe (Flail)

A flail head hydro-axe is an attachment on an excavator (CAT 320) body and is used to grind whole trees and woody vegetation into large chip residue. Flail heads are rotating blades attached to an articulating arm and are used to grind to ground surface level. Flail head hydro-axe work is performed during frozen and non-frozen soil conditions, depending on soil type and ground moisture. Flail head hydro-axes are used in hazardous fuel reduction, fire break, line-of-sight and roadside clearing projects.

*SC2.2.4.3 Mowing*

Mowing is performed on areas with woody vegetation less than 2” in diameter. Areas are mowed with a tractor (John Deere 4020)-pulled brush mower. Mowing allows for residue to remain on-site and act as a mulch layer. Mowing is performed on roadside clearing, drop zone management and wildlife food plot projects. Mowing is typically conducted on a 3-5 year rotation cycle.

### SC2.2.5 Vegetation Cutting and Thinning (Hand)

Hand thinning is individual tree specific and results in limited residual tree damage. Trees are thinned to a determined stem-per-acre specification. Hand crews use chain saws and axes to remove trees. Hand thinning operations are conducted in hazardous fuel reduction and maneuver corridor projects. Hand thinning is utilized in areas with unfrozen hydric soils.

Hand clearing is small area specific and results in limited residual tree damage around clearing perimeters. Hand crews use chain saws and axes to remove trees. Hand clearing operations are conducted around vertical training facilities and areas to small to maneuver equipment. Hand clearing is utilized in areas with unfrozen hydric soils.

### SC2.2.6 Vegetation Protection

The preservation of natural vegetation (existing trees, vines, brushes, and grasses) provides natural buffer zones. By preserving stabilized areas, it minimizes erosion potential, protects water quality, and provides aesthetic benefits. This practice is used as a permanent control measure.

This technique is applicable to all types of sites. Areas where preserving vegetation can be particularly beneficial are floodplains, wetlands, streambanks, steep slopes, and other areas where erosion controls would be difficult to establish, install, or maintain.

Preservation of vegetation on a site should be planned before any site disturbance begins. Preservation requires good site management to minimize the impact of construction activities on existing vegetation. Clearly mark the trees to be preserved and protect them from ground disturbances around the base of the tree. Proper maintenance is important to ensure healthy vegetation that can control erosion. Different species, soil types, and climatic conditions will require different maintenance activities such as mowing, fertilizing, liming, irrigation, pruning, and weed and pest control.

The principal advantage of preserving natural vegetation is the protection of desirable trees, vines, bushes, and grasses from damage during project development. Vegetation provides erosion control, storm water detention, biofiltration, and aesthetic values to a site during and after construction activities. Other benefits from preserving natural areas are because natural vegetation:

- Can process higher quantities of storm water runoff than newly seeded areas.
- Does not require time to establish.
- Has a higher filtering capacity than newly planted vegetation because aboveground and root structures are typically denser.
- Reduces storm water runoff by intercepting rainfall, promoting infiltration, and lowering the water table through transpiration.
- Provides buffers and screens against noise and visual disturbance.
- Provides a fully developed habitat for wildlife.
- Usually requires less maintenance (e.g., irrigation, fertilizer) than planting new vegetation.
- Enhances aesthetics.

Preservation of natural vegetation is applicable to all construction sites where vegetation exists in the predevelopment condition. Areas where preserving vegetation can be particularly beneficial are floodplains, wetlands, streambanks, steep slopes, and other areas where erosion controls would be difficult to establish, install, or maintain. Only land needed for building activities and vehicle traffic needs to be cleared.

Vegetation should be marked for preservation before clearing activities begin. A site map should be prepared with the locations of trees and boundaries of environmentally sensitive areas and buffer zones to be preserved. The location of roads, buildings, and other structures can be planned to avoid these areas. Preservation requires careful site management to minimize the impact of construction activities on existing vegetation. Large trees located near construction zones should be protected because damage during construction activities may result in reduced vigor or death after construction has ceased. The boundaries around contiguous natural areas and tree drip lines should be extended and marked to protect the root zone from damage. Although direct contact by equipment is an obvious means of damage to trees and other vegetation, compaction, filling, or excavation of land too close to the vegetation also can cause severe damage.

When selecting trees for preservation, the following factors should be considered:

Tree vigor. Preserving healthy trees that will be less susceptible to damage, disease, and insects. Indicators of poor vigor include dead tips of branches, stunted leaf growth, sparse foliage, and pale foliage color. Hollow, rotten, split, cracked, or leaning trees also have less chance of survival.

Tree age. Older trees are more aesthetically pleasing as long as they are healthy.

Tree species. Species well-suited to present and future site conditions should be chosen. Preserving a mixture of evergreens and hardwoods can help to conserve energy when evergreens are preserved on the northern side of the site to protect against cold winter winds and deciduous trees are preserved on the southern side to provide shade in the summer and sunshine in the winter.

Wildlife benefits. Trees that are preferred by wildlife for food, cover, and nesting should be chosen.

Other considerations include following natural contours and maintaining pre-construction drainage patterns. Alteration of hydrology might result in die-off of preserved vegetation because their environmental requirements are no longer met.

The following are basic considerations for preservation of natural vegetation:

- Boards should not be nailed to trees during building operations.
- Tree roots inside the tree drip line should not be cut.
- Barriers should be used to prevent the approach of equipment within protected areas.
- Equipment, construction materials, topsoil, and fill dirt should not be placed within the limit of preserved areas.
- If a tree or shrub that is marked for preservation is damaged, it should be removed and replaced with a tree of the same or similar species with a 2-inch or larger caliper width from balled and burlaped nursery stock when construction activity is complete.
- During final site cleanup, barriers around preserved areas and trees should be removed.

Preservation of vegetation is limited by the extent of existing vegetation in pre-construction conditions. It requires planning to preserve and maintain the existing vegetation. It is also limited by the size of the site relative to the size of structures to be built. High land prices might prohibit preservation of natural areas. Additionally, equipment must have enough room to maneuver; in some cases preserved vegetation might block equipment traffic and may constrict the area available for construction activities. Finally, improper grading of a site might result in changes in environmental conditions that result in vegetation die-off. Consideration should be given to the hydrology of natural or preserved areas when planning the site.

Even if precautions are taken, some damage to protected areas may occur. In such cases, damaged vegetation should be repaired or replaced immediately to maintain the integrity of the natural system. Continued maintenance is needed to ensure that protected areas are not adversely impacted by new structures. Newly planted vegetation should be planned to enhance the existing vegetation.

Natural vegetation (existing trees, vines, brushes, and grasses) can provide water quality benefits by intercepting rainfall, filtering storm water runoff, and preventing off-site transport of sediments and other pollutants.

A potential cost associated with preservation of natural vegetation is increased labor that might be required to maneuver around trees or protected areas.

## SC2.3 Wetlands Management

The following section details the standard practices and procedures used for wetlands reclamation on USAG-AK lands (U.S. Department of Agriculture Natural Resources Conservation Service ALASKA – Conservation Practice 657).

Wetland restoration practices are conducted to rehabilitate drained or degraded wetland by returning the soils, hydrology, vegetative community, and biological habitat to the natural condition to the extent practicable. This practice applies only to sites with hydric soil, which were natural wetlands that have been previously degraded hydrologically and/or vegetatively.

Upon completion of the restoration, the site will meet the current Natural Resources Conservation Service soil, hydrology, and vegetation criteria of a wetland. This practice is applicable only if natural hydrologic conditions can be approximated by modifying drainage and/or artificial flooding of a duration and frequency similar to natural conditions.

If the presence of hazardous waste materials in the sediment or fill is suspected, soil samples will be collected and analyzed for the presence of hazardous waste as defined by local, state, or federal authorities. Sites containing hazardous waste will not be restored under this standard.

This practice does not apply to a constructed wetland intended to treat point and non-point sources of water pollution, wetland enhancement intended to rehabilitate a degraded wetland where specific functions and/or values are enhanced beyond original conditions, or wetland creation for creating a wetland on a site location which historically was not a wetland or was formerly a wetland but will be replaced with a wetland type not naturally occurring on the site.

### *SC2.3.1.1 Criteria*

I. General Criteria

- Applicable local, state, and federal permits are secured before restoration.
- Water rights are assured prior to restoration if required.
- Vegetative buffers on surrounding uplands are established to reduce the movement of sediment and soluble and sediment-attached substances carried by runoff.
- The soil, hydrology and vegetative characteristics existing on the site and the contributing watershed are documented before restoration of the site begins.

II. Criteria for Hydric Soil Conditions

Restoration sites are located on hydric soils. If the hydric soil is covered by fill, sediment, spoil, or other depositional material, the material covering the hydric soil is removed only to the surface of the buried (or original) hydric soil, reestablishing an approximation of the original soil microtopography.

III. Criteria for Hydrology Restoration

A permanent water supply should be available approximating the needs of the wetlands. The hydrology of the site is defined as the rate, path, and timing of inflow and outflow; duration, frequency, and depth of flooding, ponding or saturation. The maximum hydrology and the overall hydraulic variability of the restored site will approximate the conditions that existed before alteration, e.g., dynamic and static water levels, soil saturation.

The standards and specifications for Dike (356) and Structure for Water Control (587) will be used as appropriate. Refer to the U.S. Department of Agriculture Natural Resources Conservation Service Engineering Field Handbook, Chapter 13, "Wetland Restoration, Enhancement, and Creation," and Chapter 6, "Structures," for additional design information. Existing drainage systems are utilized, removed, or modified as needed to achieve the intended purpose.

IV. Criteria for Vegetation Restoration

The vegetation is restored as close to the original natural plant community as the restored site conditions will allow. Determination of the original plant community's species and % composition is based upon reference wetlands of the type being restored or suitable technical reference.

Plantings, seeding, or other types of vegetative establishment is comprised of native species that occur on the wetland type being restored. Preference is given to native wetland plants with localized genetic material. Plant materials collected or grown from material collected within the same Major Land Resource Area is considered local.

In soils where seed banks realistically exist, or where natural colonization of selected native species (identified from reference wetlands) will dominate within five years, then natural regeneration is allowed. The standard and specification of U.S. Department of Agriculture Natural Resources Conservation Service Native Plant Community Restoration and Management (767) is used as appropriate. Adequate substrate material and site preparation necessary for proper establishment of the selected plant species is included in the design.

On sites which were predominantly herbaceous vegetation prior to modification and planting and/or seeding is necessary, the minimum number of native species to be established is based upon the number of ecological sites present. Sites restored to only one ecological site are established with at least two species adapted to the site. Sites with two or more ecological sites (i.e., wet meadow, shallow marsh, or slough eco-sites, etc.) are established with at least one native species on each ecological site.

Herbaceous vegetation is established by a variety of methods including: mechanical or aerial seeding, topsoiling, organic mat placement, wetland sod, vegetative sprigs, wetland hay, or etc., over the entire site or a portion of the site and at densities and depths appropriate.

Forested wetland plantings and/or seeding include a minimum of two tree or shrub species on each ecological site where appropriate. Tree (and shrub) seeding and planting follow the criteria of Natural Resources Conservation Service Conservation Practice 612 - Tree/Shrub Establishment.

V. Criteria for Wetland Functions

A functional assessment (hydrogeomorphic approach or similar method) is performed on the site prior to restoration. Restoration goals and objectives include targeted natural wetland functions for the wetland type and the site location as determined by the functional assessment and reference site data. A post-project assessment is performed after an adequate period to assess the success of the restoration.

#### *SC2.3.1.2 Considerations*

The following considerations are included in the wetland restoration practice:

- Effect of volumes and rates of runoff, infiltration, evaporation, and transpiration on the water budget.
- Potential for a change in rates of plant growth and transpiration because of changes in the volume of available soil water.
- Effects on downstream flows or aquifers that would affect other water uses or users.
- Effects on wetlands or water-related resources wildlife habitats that would be associated with the practice.
- High priority sites adjacent to existing wetlands that increase wetland system complexity and diversity, decrease habitat fragmentation, and ensure colonization of the site by wetland flora and fauna.
- Linking wetlands by corridors wherever appropriate to enhance the wetland's use and colonization by the flora and fauna.
- Effects of varying water levels in response to potential climatic events such as wet or dry periods.
- Changes in salt movement/concentrations in the soil resulting from hydrologic alterations.
- The nutrient and pesticide tolerance of the plant species planned where known nutrient and pesticide contamination exists.
- Effects of temperature on water resources to prevent undesired effects on aquatic and wildlife communities.
- Upslope water/groundwater source availability for discharge wetland.

#### *SC2.3.1.3 Operation and Maintenance*

The following actions are carried out to insure that this practice functions as intended throughout its expected life. These actions include normal repetitive activities in the application and use of the practice (operation), and repair and upkeep of the practice (maintenance):

- Appropriate use of fertilizers, mechanical treatments, prescribed burning, pesticides and other chemicals to assure the wetland restoration function will not compromise the intended purpose.
- Biological control of undesirable plant species and pests (e.g., using predator or parasitic species) is implemented where available and feasible.
- Timing and level setting of water control structures required for the establishment of desired hydrologic conditions or for management of vegetation is determined.
- Inspection schedule for embankments and structures for damage assessment is developed.
- Depth of sediment accumulation to be allowed before removal is required.
- Management needed to maintain vegetation, including control of unwanted vegetation.

## SC2.4 Water Resources Management

The following section details the management practices for water resources management on USAG-AK lands. Standard practices and procedures are listed for low water crossings and streambank repair for both interior Alaska and south-central Alaska. The structures in this section that can be used in-stream or on a streambank below the ordinary high water of the water body (e.g., low water crossing) would require permits from state (Alaska Department of Natural Resources Office of Habitat Management and Permitting, Alaska Department of Environmental Conservation) and federal agencies (U.S. Army Corps of Engineers). Any streambank stabilization project would also require a permit from the same state and federal agencies.

### SC2.4.1 Low Water Crossing Hardening

Low water crossings are installed in areas where significant seasonal hydrological features inconsistent with culvert installation are present. These structures provide for substantial flow capacity while maintaining accessibility.

Low water crossings are typically excavated 1' to 1.5' below the stream or channel bed. The excavated area is backfilled with angular or rounded cobble ranging in aggregate sizes of 3" to 7" with no fines. Banks are cut to 10:1 to 8:1 slopes with cobbles placed up and over the side lip of the crossing. Low water crossings prone to highly erosive seasonal flows will have cobbles mortared in place.

Two lane road low water crossings are constructed at a 20' width minimum.

### SC2.4.2 Streambank Repair (Interior Alaska)

Streambank stabilization is used to prevent streambank erosion from high velocities and quantities of storm water runoff. The procedures in this section that can be used in-stream or on a streambank below the ordinary high water of the water body (e.g., low water crossing) would require permits from state (Alaska Department of Natural Resources Office of Habitat Management and Permitting, Alaska Department of Environmental Conservation) and federal agencies (U.S. Army Corps of Engineers). Methods for the interior of Alaska include all the south-central Alaska techniques. In addition to the south-central Alaska techniques, there are several other methods that may be utilized in the Interior. They are:

1. Riprap - Large angular stones placed along the streambank or lake usually to the ordinary high water line.
2. Gabion – Rock-filled wire cages that are used in place of riprap to construct an apron and prevent further erosion of the toe of the bank.
3. Log Cribbing – Retaining walls built of logs to anchor the soils against erosive forces. These are usually built on the outside of stream bends.

These types of streambank stabilization may be used where vegetative stabilization practices are not practical and where the streambanks are subject to heavy erosion from increased flows or disturbance during construction. Stabilization should occur before any land development in the watershed area. Stabilization can also be retrofitted when erosion of a streambank occurs.

Streambank stabilization structures should be planned and designed by a professional engineer licensed in the state where the site is located. An important design feature of streambank stabilization methods is the foundation of the structure; the potential for the stream to erode the sides and bottom of the channel should be considered to make sure the stabilization measure will be supported properly. Structures can be designed to protect and improve natural wildlife habitats; for example, log structures can be designed to keep vegetation. Log structures are often constructed with spruce or birch tree boles. Permanent structures should be designed to handle expected flood conditions. A well designed layer of stone can be used in many ways and in many locations to control erosion and sedimentation. Riprap can also be used for flow channel liners, inlet and outlet protection at culverts, streambank protection, and protection of shore lines subject to wave action. It is used to expose the water to air as well as to reduce water energy. Riprap and gabion (wire mesh cages filled with rock) are usually placed over a filter blanket (i.e., a gravel layer of filter cloth). Riprap is either a uniform size or graded (different sizes) and is usually applied in an even layer along the streambank.

Streambank stabilization structures should be inspected regularly and after each large storm event. Structures should be maintained as installed. Structural damage should be repaired as soon as possible to prevent further damage or erosion to the streambank.

### SC2.4.3 Streambank Repair (South Central)

Streambank stabilization practices are installed along banks that are eroding or unstable and include bio-engineering with plant materials and engineered rock structures. These practices restore and/or protect damaged or compromised banks. On-site conditions, including soil type, area hydrology, vegetation, water velocity and icing impacts, determine which practice is installed.

The main bio-engineering stabilization practices used on USAG-AK lands are live staking, fascines, spruce tree revetments, brush layering, root wads emplacements and vegetative matting. The standard practices for live staking and fascines are included in the re-vegetation section.

#### *SC2.4.3.1 Spruce Tree Revetments*

Spruce tree revetments consist of whole spruce trees laid parallel to the streambank and are installed to provide immediate erosion control and bank protection. The trees are secured tightly to the bank with cable and earth anchors. Tree tops are pointed downstream and overlapped a minimum of 30% of the whole tree length. Care should be taken to avoid unnecessary damage to, or removal of, tree limbs.

A combination of the three bio-engineering practices is used at sites with varying conditions and stabilization opportunities.

#### *SC2.4.3.2 Rock Armoring*

The most common engineered structure for streambank stabilization is rock armoring, also known as riprap. Riprap consists or large angular rock strategically placed in a continuous layer or blanket on a shaped slope and toe. The rock protects the bank from erosion and scour. The length of a riprap blanket is determined by stream dimensions, water velocity and soil types. These structures are always “keyed-in” at both the upstream and downstream end of the structure and most often, placed on top of permeable geo-textile fabric.

Riprap is installed with a backhoe (Case 235) or excavator (CAT 320) from the top of the bank. Riprap is strategically placed to prevent excess rock in streambed.

I. Bank Preparation

Banks are prepared by removing vegetation, shaping side slopes to a 3:1 slope (maintaining existing bank height and streambed width) and cutting a trench at the toe of the bank below base elevation into the creek bed.

II. Geotextile

Non-woven geotextile (Natural Resources Conservation Service Spec CS-61) is installed from bottom of trench to 18” over the top of the bank. Riprap is carefully placed on top of the geo-textile.

IV. Riprap

Riprap is made up of a mix of classified angular or round rock and varies in size. Rock sizes are dependant on streambank dimensions and water velocity.

Rock riprap is typically installed with a minimum blanket thickness of 18”. Common rock riprap gradation is:

| Size Opening | % Passing on a Dry Weight Basis |
|---|---|
| 12” | 100 |
| 10” | 85 |
| 7.5” | 50 |
| 3” | 15 |

### *SC2.4.3.3 Rock Barb*

Rock barbs, consist of constructed rock piles set in the streambed and are installed to deflect erosive water forces away from vulnerable streambanks. Rock barbs are keyed into the existing bank slope and streambed, extend into the stream and are pointed upstream. Dike length, barb spacing, rock size and gradation and depth of bed and bank keying are dependant on stream size and hydrology, soils and protection requirements. Barb dikes can include wire basket enclosures for rock placement. It should be noted that these structures must be designed by an experienced hydrologist/engineer.

Rock barbs are installed with a backhoe (Case 235) or excavator (CAT 320). Silt fences or other erosion control practices are installed during construction to help prevent downstream siltation. Dike rock is strategically placed to prevent excess rock in streambed and to ensure correct placement. Appropriate re-vegetation practices are installed on exposed bank soils after dike installation.

A specific example of a rock barb construction for Ship Creek Creek is as follows. All applications for rock barbs are very site specific and need to be designed by an engineer/hydrologist.

For Ship Creek, rock barbs are to be angled from 10 to 25 degrees upstream and built of a well graded stone with an upper weight limit of 650 to 1000 pounds. The deflectors are to be spaced 50 feet apart starting from the upper extent of the damage area down to the lower extent. The height of the deflector at the bank end rise will be at the annual high water mark (i.e., 2 ½ feet deep for Ship Creek at Fort Richardson) and taper down to the annual low flow level mark (i.e., 1 ½ feet deep for Ship Creek at Fort Richardson) at the stream end rise. Approximately 4 inches will be spaced between each boulder to accommodate small fish fry moving up and down the stream. The length of each weir will be one half the base flow width of the stream. Each weir will be approximately 3 feet wide. Trenches will be dug to accommodate the length, width and depth of the stones to be utilized for each barb. The trenches will be dug at a minimum of 1 ½ feet deep below the creek bottom in order to key the boulders into the streambed and minimize shifting during high water. The trench may be deeper in order to accommodate the individual boulders utilized. The main goal is to achieve the correct height of the boulders at the bank end and stream end rise.

### *SC2.4.3.4 Root Wad Stabilization*

There are many ways to install root wad structures. Footer logs, header logs and geotech fabric can be incorporated into these structures as well as the specific method described below.

One particular method is to emplace overlapping tree root wads that will span from the upper extent of the streambank to the lower extent of the damaged area. The root wad fans will start approximately 8 feet out from the edge of the existing road. Each root wad will have a trunk that is a minimum of 12 feet in length. The contractor will dig trenches into the road approximately 4 to 5 feet down, which will be accommodate each tree trunk accordingly and ensure that the root wad portion of the tree is low enough to be partially embedded into the river bottom. The contractor may need to dig shallow trenches (1 foot or less) to ensure that the root fan will be embedded into the river bottom. Riprap may be included for a base or to help anchor the boles. Anchoring boles with dead man anchors or other such devices is acceptable.

Once the root wads have been emplaced, the contractor will backfill the root wad trenches with dirt and cobble stone approximately 8 feet out to the root wads and spanning the entire length of the damaged area. The height of the backfill material needs to match the current height of the existing bank and then gently slope down to embedded root wads at the stream end rise.

#### *SC2.4.3.5 Willow Live Staking*

Dormant cuttings are the primary plant material used in live staking. Dormant cuttings are harvested from living woody plants in a dormant (not actively growing) state. The cuttings are collected from plants that can root easily, without special treatment, such as certain willow species, poplar and cottonwood.

Live staking will be implemented to install the dormant cutting directly into the ground. This technique is often utilized where single stem plantings will provide adequate plant cover, slope stability and fish habitat.

Several live stakes can be prepared from one dormant cutting. Cut stakes 24 to 36 inches long, ¼ to ½ inches in diameter (slightly larger diameter cuttings will also work). Soaking the end of the willow stakes for 3-15 days prior to planting increases survival rates too. Discard flower buds ("pussy willows"). Flower buds typically occur at the top 2/3 of a branch that was produced during the past growing season. At least one or two leaf buds, which are smaller than flower buds, must be present near the top of each live stake.

Use rebar, ½ inch or less in diameter, to create a planting hole for longer stakes, particularly when planting in compact and gravelly soils. Tightly pack the soil around the stake so that no air pockets remain.

Plant stakes upright 1 to 3 feet on center. Stakes should be planted as vertically as possible, placing at least ¾ of the stake below ground so that only one or two leaf buds are left exposed above the ground. The intent is to maximize the surface area for rooting so a good root system can develop and support a healthy shoot system. If more than one or two buds, ¼ of the stake, or 4 inches of the live stake is extending above the soil surface, trim the stake.

The contractor will water the live stakes during the re-vegetation process to help remove air pockets and increase contact between the soil and surface of the live stake. Moist soil is needed during the period the live stake is rooting and becoming established. Topsoil is not required. Survival rates for drier sites may be increased if larger cuttings are used.

Willow harvest sites need to be identified and permission obtained to collect cuttings. Harvest sites are easier to identify when leaves are present. Collect cuttings during winter/early spring before leaves appear, preferably before March 31, if they are to be used for spring and early summer plantings. For fall plantings, collect cuttings in the late summer/early fall, after plants have gone dormant and the leaves have changed color or have dropped. Select cuttings with leaf buds near the top of each cut line. Avoid flower buds ("pussy willows") if possible; these buds typically occur at the tips of branches produced during the last growing season. These branch tips tend to be smaller than ¼ inch in diameter. Select branches ¼ to 2 inches in diameter and at least 3 to 4 feet long. If necessary, branches can be cut to a shorter length at the time of installation. The potential for drying during storage is reduced when the cuttings are stored in longer pieces.

Cuttings need to be stored to maintain viability. If collection occurs while daytime temperatures remain below freezing, freeze or refrigerate the cuttings until planting. If daytime temperatures are above freezing during collection, cuttings should be refrigerated. Frozen cuttings can be stored with a small amount of snow to help reduce drying. Refrigerated cuttings should be stored at 31° F to 40° F and 60 to 70% humidity. Monitor the condition of the cuttings regularly to detect problems such as drying, sprouting or mold.

Take cuttings directly from cold storage to the planting site. Only the plant material required for each day should be removed from storage, particularly if the weather is windy and/or warm. On site, the cuttings should be stored away from direct sunlight, heeled into moist soil, or stored in water until planting.

Plant dormant cuttings as soon as the soil has thawed and no later than July 1, or plant in late summer/fall before the ground freezes. The ability of plantings to become established and resume growth the following spring declines quickly for plantings made after July 1. If the project is delayed and rescheduled for fall, do not try to store the cuttings that were collected in the spring until fall. Plan on preparing new cuttings once the plants have gone dormant.

Collect different species of woody cuttings that root easily and can be mixed in the layers; rooted plants can also be added to create a hedge-brush layer. If the brush layer is installed below the ordinary high water level, branches from alders and willows that do not root readily may be used, since these plant layers probably will not survive and become established, living plants.

#### *SC2.4.3.6 Vegetative Matting*

A vegetative mat is a large transplant of plants with roots and soil intact. Dimensions of the mats vary from one to several feet square and may contain woody and/or herbaceous vegetation. The greatest benefit of this transplanting technique is that vegetative cover is provided immediately after the mat is placed at the new location. The mats often contain many plant species, especially native plants that cannot be obtained elsewhere. Often, the cost will be for labor and machinery for moving and installing the mat.

The contractor will harvest a vegetative mat by cutting the shoots and root/soil mass into a block. The root/soil mass is cut as deeply as possible. The mat is then lifted from the ground by hand or with mechanized equipment and transported to the planting site.

Prepare the planting site by creating a depression in the soil that will accommodate the dimensions of the mat. The sides of the mat should be covered by soil. If the mat is placed directly on the surface with other mats immediately adjacent to each other, make sure that the edges of the mat are not left exposed to the air, which would cause damage to the roots. If needed, soil should be placed in the spaces between mats to cover the roots.

#### *SC2.4.3.7 Brush Layering*

Brush layering is used to rebuild the streambank. Branches are placed on horizontal benches that follow the contour of the slope and provide reinforcement to the soil. Additional stability is provided when the front of the soil layer is needed with grass while the woody plants are becoming established.

Dormant willow cuttings are the primary plant material used in brush layering. Dormant cuttings are harvested from living woody plants in a dormant (not actively growing) state. The cuttings are collected from plants that can root easily, without special treatment, such as certain willow species, poplar and cottonwood.

Begin layering at the bottom of the slope at the ordinary high water level, often identified by the line of growing vegetation. Excavate a bench 2 to 3 feet deep so that it angles slightly down and into the slope.

Twenty to 25 branches are placed on the bench, slightly crisscrossed. The cut ends are placed into the slope with the tips extending beyond the edge of the bench no more than ¼ the total branch length. Place 2 to 4 inches of soil on top of the branches and tamp into place. Re-vegetation fabric will be used to keep soil in place when a brush layer is installed on steep slopes and streambanks. The fabric is installed by placing it on top of the soil so that at least two to three feet can be anchored by wooden stakes and the next soil-gravel layer. Allow 5 to 6 feet of fabric to extend beyond the brush layer so that it will lap over and cover the soil-gravel mix, then stake into place.

Repeat the branch, topsoil, wrapped soil-gravel mix layering sequence in order to rebuild the bank up to the original bank height. Fill slopes can be created at the same time a brush layer is installed. On a cut slope and existing streambanks, each layer is excavated at the time the brush layer is installed.

#### *SC2.4.3.8 Brush Mattressing*

This procedure involves using live, woody material ½ to 3 inches in diameter and random lengths. This material is placed 4 to 6 inches deep on sloped areas. Generally starting at the bottom of the slope, they are laid in a crisscross pattern protecting 6 or more feet of slope. They are held in place with wedge- like dead stakes (pieces of wood cut in long wedges. They measure 1½" by 3" inches by 2½ feet long). These dead stakes are driven into the soil to secure wattles, brush mattressing and other applications of soil bioengineering and secured with string or wire. Four inches of loose soil is placed on top to sufficiently cover the majority of the branches. The brush mattressing will act as an immediate sediment trap and grows into a shrubby carpet-like protective barrier. This is effective on slopes with 2:1 ratio or flatter.

# SC3 Forestry and Wildfire Management

The following section details the standard procedures and practices for forestry and wildfire management.

## SC3.1 Forest Management

Forest management includes standard practices and procedures for timber sales, timber stand improvement, firewood and personal use timber, reforestation, urban forestry, and forest health.

### SC3.1.1 Timber Sales

Bureau of Land Management and Army timber management practices and contract stipulations will govern timber sales on USAG-AK lands. Timber sales on withdrawals where the Army holds vegetation rights will be governed by Army practices and contract stipulations. Contract examples and procedures for timber sales can be found in Army Guidance Procedures for Installation Conducted Timber Sales, 2004. The Garrison Commander has the authority to conduct timber sales and must work through a Contracting Officer. All proceeds from the sale of Army timber and forest products must be deposited to Deposit Fund Account 21F3875.3960-C S99999. Some common timber sale requirements include:

- The construction, improvement, and maintenance of safe and environmentally sound road systems.
- Adherence to National Environmental Policy Act, National Historic Preservation Act, and other applicable requirements.
- Minimal damage to wetlands as defined by the wetland management plan.
- The felling and yarding of timber in such a way as to protect soil and water quality, residual trees, and human safety.
- The treatment of logged sites to prepare them for the next generation of trees.

- The disposal of logging slash for silvicultural, insect control, and/or fire hazard reduction purposes.
- Mitigation measures for protecting wildlife habitat.
- Adherence to best management practices to preclude erosion from roads and harvest operations.
- Other miscellaneous provisions, where appropriate, such as meeting minimum fire requirements and application of disease control measures.
- Adherence to State of Alaska Forest Practices Act Guidelines.

Forest land use plans are prepared prior to commercial sales of forest products. Plans include sale boundaries, cruised volume, silvicultural prescription, road layout, best management practices for prevention of soil erosion and sedimentation, water quality considerations, cultural resources protection, wildlife considerations, harvest method(s), scaling requirements, slash disposal, site preparation, and regeneration requirements. Documentation for compliance with National Environmental Policy Act as well as required cultural resources surveys would be completed prior to sales. The timber sale program is designed to utilize material to be clearing for military mission support and offsets clearing costs.

**USAG-AK Timber Sale Guidance**

Installation Commanders have the authority and responsibility to execute timber sales—draft, distribute, and advertise invitations for bids; review and accept bids; award and administer timber sales contracts; and collect, deposit and account for fees. This authority may involve the following installation personnel—installation foresters and natural resources managers, Directorate of Public Works Environmental Division, legal and contracting offices. The Commander/Contracting Officer designates the Contracting Officer's representative. This document was developed from Installation Army Guidance for Timber Sales, Procedures for Installation-Conducted Timber Sales (2004).

1. **Prerequisites for Timber Harvest**

According to Army Regulation 200-2—*Environmental Analysis of Army Actions*, all natural resources management plans must undergo a National Environmental Policy Act evaluation. Installations must have an approved Integrated Natural Resources Management Plan (INRMP) that addresses forest management. The effects of timber sales must be consistent with the purpose of the INRMP. Actions associated with forest management must undergo a National Environmental Policy Act analysis and documentation. Installations must have adequate contract support dedicated to timber sale contracts. This should include a qualified appraiser, contract specialist specializing in sales rather than purchases, legal counsel specializing in contracts, a financial officer authorized and qualified to receive and account for proceeds, and Contracting Officer's representative. The installation forester must work in conjunction with a certified Contracting Officer's representative.

2. **Coordination**

Installation foresters must coordinate harvest operations with range managers and training schedules. Installation foresters should develop a coordination system with G-3 Section or Range Officers. Clearance must then be verified daily by the purchaser by calling the Range Officer requesting activity in certain training areas. The installation forester should review objectives with the range manager periodically to be sure that they clearly understand and continue to understand the assigned functions of the forestry program. Installation foresters will require support from range managers, installation resource management, contracting, and legal offices. Installation foresters must coordinate with the appropriate staff as necessary.

3. **Methods of Disposal**

The sale of timber from government lands is adaptable to both lump sum and unit price methods. Interruptions or interference by military training or project operations, metal contamination, the lack of time to prepare accurate and reliable cruise estimates, and the possibility of having markings on trees destroyed by range fires should be considered before the method of sale is determined. Under the unit price sale, the timber is advertised or offered for sale on a timber product basis, such as sawtimber, poles, piling, or pulpwood, by species or groups of species within designated logging units, or groups of logging units and bids invited and accepted on a per unit price. When the weight method is used, the weight determines the volume by converting weight to units (thousand board feet, cords, or tons) through a conversion factor determined by test scale or as a predetermined factor. A lump sum sale is one where all marked or designated trees are sold for a lump sum amount. The lump sum sale method should be used whenever the volumes to be sold can be substantiated and metal contamination and military interferences are not anticipated. The savings which ordinarily accrue from lump sum sales are the difference between the cost of weighing or otherwise measuring the product (which is eliminated) and the cost of estimating the product to be produced by tally or cruise.

Forest product sales are to be performed in accordance with Installation Management Agency policy, AR 200-1, AR 405-90, AR 405-80, and AR 200-1 implementation guidance. All revenue from the sale of forest products dollars shall be deposited into the CRFA (Budget Clearing Account 21F3875.3960 20-C S99999). When forest products are removed from Army land by any means other than a forest product sale (e.g., generating energy on the installation), a dollar amount equal to the fair market value is to be deposited in the CRFA by the proponent of the activity removing the forest products. The exception is that forest products may be removed or used to directly assist the military mission without payment. Forest products will not be given away, abandoned, carelessly destroyed, used to offset costs of contracts, or traded for products, supplies, or services. All forest products are to be accounted for and harvests completed prior to the start of any construction that may impact forest resources. Lessees of Army real property, such as the Residential Community Initiative developers, cannot be given authority to remove and dispose of timber. All forest products disposals remain the responsibility of the Army. Forest products may be harvested to generate electricity or heat, provided a dollar amount equal to the fair market value is deposited to CRFA, and the installation's program where the timber was harvested is credited with the income. The installation's approved INRMP, and forest management plan should note that installation forest products may be harvested for the purpose of generating electricity or heat on the installation and a record of such action is maintained by the Directorate of Public Works. Forest management will continue on land reported as excess until land transfer occurs. Clear-cuts on Army forest areas are prohibited unless approved for a specific management purpose. Thinnings, intermediate harvests, and salvage cuts are to be continued if the actions are described and planned in the approved INRMP/forest management plan. That portion of the proceeds from sales of land that is attributable to the value of standing timber on the land sold will be deposited to the CRFA. Installation sawmills and the logging operations incident thereto are not authorized except:

- To the degree required to train troops in specialized construction activities.
- When necessary to prevent the compromise of security information.
- Temporary response to natural disasters.

Reports of Availability are required for the disposal of forest products. See Section VII for clarification. All Army solicitations and contracts for timber sales affected by the Forest Resources Conservation and Shortage Relief Act of 1990 shall contain a provision restricting the export of unprocessed timber procured on Army lands. Installations required to have an INRMP may not sell forest products unless the effects of the sale or leasing are compatible with the purposes of the INRMP. Individuals may be allowed to collect edible or non-timber forest products (including firewood) in designated areas if the removal would be a cost savings to the installation and the value is not high enough to justify the expense of a sale. All of these uses must be addressed in the INRMP. Clear-cuts on Army forest areas are prohibited unless approved for a specific management purpose. Installations have the option of U.S. Army Corps of Engineers (U.S. Army Corps of Engineers)-conducted sales, conducting timber sales in-house, using the services of other groups or agencies, or combinations of these options (see appendix 4, *Army Timber Sale Guidance*). The planning for timber sales begins with the development of an INRMP and/or a forest management plan that outlines the forecasted timber sales over a given five year period. Installations must comply with National Environmental Policy Act, National Historic Preservation Act, and other environmental laws/regulations when conducting forest product disposal. Installations and U.S. Army Corps of Engineers Districts are responsible for collecting and accounting for forest product disposal proceeds.

The level of National Environmental Policy Act documentation required for a proposed action is to be determined from the Baseline Data and a Biological Assessment or Evaluation. The INRMP (including the forest anagement section) is to be integrated with the Installation Master Plan Environmental Assessment/Environmental Impact Statement. An environmental assessment is normally required for commercial timber sales and harvests. Based on National Environmental Policy Act policies and procedures, some actions do not individually or cumulatively have a significant impact to the environment and therefore may be Categorically Excluded (CX) from an environmental assessment or environmental impact statement documentation. CXs may include the salvaging of wood products from dead and dying trees, trees that are designated to be removed based on approved construction and applicable environmental assessment or environmental impact statement, thinning of young overstocked timber stands, or timber stand and/or wildlife habitat improvement activities which do not include the use of pesticides. A Record of Environmental Consideration is required for each CX. The National Environmental Policy Act evaluation process must be adhered to for all proposed actions. Refer to AR 200–1.

After informal coordination with the U.S. Army Corps of Engineers District Commander and public notice of availability, Installation Commanders or their delegates (but not below the Director of Engineering and Housing) are authorized to sell standing timber and other forest products with an estimated value under $15,000, in conformity with the forest management plan. This authority should be used whenever possible to improve the efficiency and economy of the timber sales program. Timber may not be given away. The total of such sales in any fiscal year will not exceed $30,000 at each installation. Installations are authorized to administer, advertise, and award minor timber sales and emergency timber that do not exceed $15,000. Master reports of availability, sale specific reports of availability, and installation contracting officers are not required for this method of timber disposal. Additional information can be found in AR 405-90, *Disposal of Real Estate.*

Garrison Commanders, using relevant and appropriate statutory authorities, have the authority and responsibility to execute timber sales; draft, distribute, and advertise invitations for bids; review and accept bids; award and administer timber sales contracts; and collect, deposit and account for fees. This authority will involve a warranted Contracting Officer. This authority may involve the following installation personnel: installation foresters and natural resources managers, Director of Public Works (or Environment), resource management, or legal and contracting offices. The contracting officer designates the Contracting Officer's representative, usually the installation forester. A U.S. Purchasing and Fiscal Officer has the authority to execute timber sales on federally owned Department of Army lands for which he/she is accountable via DD Form 1354 that are licensed to a State Army National Guard. Disposal of forest products is further detailed in the Army Timber Sale Guidance.

In the event of a declared natural disaster that affects installations, timber must be salvaged while it is merchantable to recover Army property value, to prevent costly and unnecessary clean-up actions, and to reduce the risk of catastrophic fire events and insect/disease outbreak. Special provisions or federal agency exemptions may apply to National Environmental Policy Act, National Historic Preservation Act, and other environmental laws and regulations during federally recognized natural disasters. Natural resource managers should coordinate with their proponent organization to identify if any exemptions exist. All methods of disposal should be explored when salvaging timber, including U.S. Army Corps of Engineers and installation-conducted timber sales, and commanders' sales. Installations should work to quickly remove salvageable timber while it is still merchantable. Installations should coordinate with their proponent organization and the U.S. Army Environmental Center to identify if any special exemptions to environmental laws and regulations exist regarding the salvage of timber. Natural resources managers should ensure that the emergency salvage timber is addressed in installation environmental assessments, environmental impact statements, Master Plans, and other appropriate environmental planning documents. Some actions do not individually or cumulatively have a significant impact to the environment and therefore may be Categorically Excluded from an environmental assessment or environmental impact statement documentation. Categorical exclusions may include the salvaging of wood products from dead and dying trees. Installations should work with their proponent organization and U.S. Army Corps of Engineers District to identify potential natural disasters that would require the salvage of installation timber, and develop a plan of action to expedite the salvage of timber caused by a natural disaster.

**4. Pre-Disposal Planning**

**a.** Reports of Availability

Installation Commanders will submit an annual Timber Availability Report to the Major Command 90 days in advance of the fiscal year. The Major Command will review and approve as appropriate, timber declared available for harvest. The Timber Availability Reports should contain the following: volume and type of timber, acreage of sale area, type of sale (e.g., selective thinning, seedtree, or clearcut), timing of the sale and justification, any special requirements or restrictions for the sale, map of sale area, volume tables of products to be advertised for bid, anticipated method of sale (e.g., U.S. Army Corps of Engineers or in-house). Installations must indicate in the Timber Availability Report the proportion of sales that will be conducted in-house and the proportion that will be conducted by the U.S. Army Corps of Engineers. The Major Commands will forward the Timber Availability Reports to the appropriate U.S. Army Corps of Engineers District. If the total annual revenue generated from installation-conducted sales exceeds $75,000, the installation must get Headquarters, Department of Army approval.

**b.** Appraisal

The installation forester shall obtain an appraisal, by an experienced and qualified person, of the fair market value of the timber to be sold. A formal appraisal is not required when the fair market value does not exceed $50,000; however it is recommended that appraisals be conducted for all timber sales. When the estimated value is less than $50,000, a short form appraisal may be used. The appraised value shall be considered the minimum desirable bid. Stumpage value is determined by comparison with current stumpage prices in the area with adjustments for timber quality and logging costs. Various applications are: comparison with nearby and recently advertised sale of timber similar in quality and logging costs, and average stumpage prices by state or locality usually adjusted for timber volume and quality, distance to mill, military mission restrictions, and geographic location.

**c.** Invitations for Bid

Invitations for bid will be prepared in writing by designated installation personnel and provided to all prospective purchasers. The installation organization shall maintain a mailing list of prospective purchasers for distribution of invitations. Each bid will be assigned a consecutive number. The invitation for bid shall contain or incorporate by reference all terms and conditions of the sale. Prospective bidders may inspect the timber upon request. It is recommended that the installation hold one pre-bid showing for all prospective bidders. While showing timber offered for sale, the installation forester should explain the general terms and conditions of the sale, time limits established for harvesting, type of equipment necessary, and any special conditions or restrictions for the sale (i.e., sensitive areas or cultural resources to be protected). The installation forester must widely publicize all timber sales, giving adequate information for all individuals that may be interested in making an offer, through such means that will allow for full and free competition. The advertisement shall state the place where the bids are to be delivered or mailed and shall state the place, date, and time of bid opening. The invitation for bid should be advertised for a minimum of 30 days. The installation forester should allow at least a 30-day response time from the date of publication of the invitation for bid. Bid deposits, generally 20% of the total sale value, must accompany the offer. The installation forester or Contracting Officer's representative may adjust the required deposit when circumstances warrant. When small volumes of timber, having an estimated fair market value of $25,000 or less, are made available on an emergency basis, such as timber in the way of construction, within utility or road rights-of-way, or within range training areas, the installation forester may be authorized to solicit quotations by telephone or by contacting at least three interested timber purchasers. If the value of timber in an emergency timber sale is less than $1,000 the entire amount must be paid before harvesting can occur. If the value of timber is over $1,000 the purchaser should pay 25% of the bid price before harvesting. Performance bonds are not required for emergency timber sales. When carrying out this type of solicitation, a memorandum of record should be prepared for the official file. It should explain the reasons for the emergency sale, prospective bidders contacted, and the bids received.

**5. Receipt and Review of Bids**

All bids will be sealed, in writing, accompanied by the required deposit, and submitted to the Contracting Officer's representative or installation designee. All bids will be opened and publicly disclosed, per the invitation for bid, by the Contracting Officer's representative. All bids should be recorded on an Abstract of Offers, Standard Form 1409. When bid deposits are received, the bidder, time, and date should be recorded on a Record of, and Receipt for Bids and Responses, GSA Form 1378. The installation forester or Contracting Officer's representative shall review the bids and determine that the bid prices are reasonable, i.e., commensurate with the fair market value of the timber to be sold and were independently arrived at in open competition, and that the purchaser meets the necessary qualifications. It is within the discretion of the installation to determine if acceptable bids are received. When an acceptable bid is not received, the installation forester may allow the highest bidder an opportunity to increase his bid. The bidder shall be given a reasonable period of time, not to exceed a period of 15 working days, to increase the offered price. The Contracting Officer may decide to accept the highest bid, even if it does not meet the appraised estimate.

**6. Award of Contract**

Contracts are legal documents that the bind the government. Timber sales contracts must be awarded and administered by a warranted Contracting Officer. The Contracting Officer delegates authority and responsibility to the Contracting Officer's representative. Award shall be made with reasonable promptness by notice to the bidder whose bid, conforming to the invitation, will be most advantageous to the installation, price, responsiveness, and responsibility considered. When an offer is accepted, the Contracting Officer's representative shall notify all other bidders and return their deposits. The Contracting Officer's representative should document a summary of the bids, recommendation for award, and the justification for award. A sample timber sales contract template is available from the Army Environmental Center. Minor Forest Products Sales Contracts may be used for the sale of fuelwood and other forest products sales of small lots that do not require a timber contract, the value must be less than $50,000. A performance bond is required from the purchaser to mitigate any damages that may be incurred. Performance bonds should be based on the potential for damage and can be a fixed amount or a %age of the total sale (generally 10-15%). The bond can be a cash deposit or a surety bond. The purchaser and surety company must complete Standard Form 25. Performance bonds are deposited into suspense account 21F3875.3960. At the completion of logging operations, if no damages are incurred, performance bonds are refunded.

7. Contract Administration

All parties involved in administering the contract, including but not limited to the Contracting Officer's representative, installation forester and staff, range manager, installation resource management, contracts, and legal personnel, the purchaser and field crews, shall be familiar with the terms and conditions of the timber sales contract. It is the responsibility of the Contracting Officer's representative and the installation forester to fairly and firmly administer the timber sales contract to ensure that all parties meet their obligations and comply with the terms of the contract. Provisions for contract modification should be stipulated in the original contract. Contract modifications must be in writing through a supplemental agreement (Standard Form 30). Modifications should be within the limits that preserve the original sale premise. Modifications shall apply only to the uncompleted portions of the contract. All contract modifications require agreement by the Contracting Officer's representative and the purchaser. Contract extensions shall not be made unless the purchaser has operated in diligent manner and in accordance with the approved plan of operation or if an extension would be in the best interest of the installation.

8. Operations Planning and Procedures

Prior to commencement of any cutting on a sale area, the installation forester will hold a pre-work conference with the purchaser's representative and the woods superintendent for the purpose of explaining and discussing harvesting and contract procedures. The Pre-Harvest Conference Checklist should be used for the conference. On completion of the discussion, the checklist should be signed by all parties and filed in the timber sale folder. Of major importance will be a discussion of all aspects of contract administration; best management practices; sensitive areas; equipment and personnel requirements; security measures; range firing schedules; method of payment for timber; utilization standards; installation regulations; assignment, inspection, and operation of vehicles; fire and installation safety regulations; and assignment of logging units. The installation forester is responsible for informing purchasers of installation access and security restrictions. The installation forester should ensure that all personnel, vehicles, and equipment have the necessary identification and documentation. The installation forester will always require the purchaser to retain sufficient personnel and equipment in order to maintain the level of production specified in the contract. If the order of cutting is not designated under the terms of the contract, it will be the responsibility of the installation forester to designate the same. If there is a choice, the installation forester will assign the most undesirable portions of the sale first.
The sale of metal-contaminated timber shall be segregated from other sales. All contracts will contain a clause on how to deal with military metal encountered. When military metal is located in logs or stands of timber, the purchaser should be informed of procedures required to be followed under the terms of the sale contract. The formal decision as to whether the timber is too contaminated to harvest will be made by the installation. The installation must, through inspections of field activities, follow and keep abreast of all phases of harvest operations throughout the contract period. Detailed instructions must be given to the purchaser, or purchaser's representative, concerning special contract requirements and, also, conditions unique to the particular installation or operational area. Assignments and instructions to inspectors must be clear and given sufficiently in advance to permit the inspector to plan work.
Contracts will be inspected frequently by the installation forester or designated personnel to ensure compliance with contract terms and to preclude the development of problems, such as unsatisfactory restoration.

**9. Collection of Bills**

Bid deposits and subsequent payments will be in cash, cashier's check, certified checks, traveler's checks, bank drafts, or postal telegraphic orders. Personal checks may be accepted only when a bond or bank letter of credit is on hand that will cover the amount due. Bid deposits should be retained and secured at the installation until the contract is awarded. Accounting for and disposing of bid deposits from unsuccessful bidders will be achieved by returning guaranteed negotiable instruments to the bidders. Advance stumpage payments will be collected from the purchaser prior to cutting for unit sales. Total payment will be collected prior to logging for lump sum sales. Payments must be recorded. It is suggested that installations use a Cash Collection Voucher, DD Form 1131 for recording payments. Deposit bids received from successful bidders, performance bonds, and subsequent collections into Account 21F3875.3960. As further assistance in the collecting of bills, it is suggested that a simple electronic recording system be established at the installation forestry office for each sale contract indicating: contract number, amount of bill, date of bill, date bill received, deadline date for payment of bill, date of collection. Review of this system at the appropriate time will indicate any outstanding bills and action necessary to be taken by the Contracting Officer's representative. The Contracting Officer's representative is also obligated to request and collect advance payments from the purchaser as required.

**10. Proceeds and Expenses**

The Army forestry program is an automatic reimbursement program. Proceeds are deposited into the U.S. Army General Fund Budget Clearing Account, 21F3875.3960 20C S99999 and recorded on the RCS CSCFA-302 report. Within 90 days after the conclusion of each fiscal year, DFAS-IN, Directorate of Accounting, Budget Execution and Reporting Division (DFAS-IN/AAB) will compute the concluding fiscal year's unfilled forestry orders (transferring excess to or removing required funds from that fiscal year's Army General Fund Budget Clearing Account 21F3875.3960), compute and provide 40% of the net proceeds per installation to the appropriate states and deposit the remaining net proceeds into the DOD Forestry Reserve Account (21X5285). Forestry Reserve Account funds are made available for military departments for use in CONUS, for improvements of forest lands, unanticipated contingencies in the administration of forest lands, and natural resources management that implements approved plans and agreements. The Army is the executive agent for the DOD Forestry Reserve Account.

**11. Keeping Records**

For unit sales, the purchaser shall mail or deliver to the Contracting Officer's representative by no later than Saturday of each week, a summary report or statement showing the timber harvested from each cutting unit during the preceding week. The report will reflect the volume of sawtimber and/or pulpwood harvested, together with weight tickets substantiating the report. If the summary report is not received by the date indicated above, all operations under the contract shall be suspended until the above requested volume data is received.

To minimize the amount of required paperwork and logging supervision a lump sum sale is recommended. The buyer pays for the entire sale amount at the contract signing, rather than in multiple future payments. Another benefit is that this method removes all need to sort timber by product classification. The buyer has already paid for the products and how the products are sorted is irrelevant to the government. Lump sum sales work equally for all types of sales—clear-cut, marked thinning, or operator select. The installation forester must conduct inspections for lump sum sales to ensure that only timber included in the sale is removed.

**12. Security, Inspections, and Quality Assurance**

Installation inspection personnel will be assigned to make periodic inspections of the logging operation. Where possible, the same inspector should continue with the operation throughout the tenure of the contract. Inspections should be conducted regularly, daily or weekly, as appropriate. For ready reference, the inspector of a designated contract will keep a copy of the contract and sale area progress maps available in the field at all times. The inspections will be conducted in all field operational areas as often as necessary, giving particular attention to the amount of equipment and personnel being used by the purchaser, methods and manner of timber felling, removal, conditions of roads, security measures, if progress within sale area logging units is proper, and production is adequate to complete the contract on schedule. Cut-over areas will be inspected and approved as the contract progresses and as field work is completed in a given logging or cutting unit. It is recommended that the inspector keep a Daily Timber Inspection Report on each contract they are responsible for while on duty. The inspector's activities will be inserted each day. It will be turned in to the installation forester or Contracting Officer's representative for review. The date and initials of the person making the review will be placed on the form. Since the form is a permanent record while the contract is in force, it will be filed at the installation and will be available in the event the information is needed to address contract issues. When violations of contractual terms are detected for which liquidated damages are established under the contract, the installation forester should gather pertinent information. This information will include: the number and diameter of trees involved, the circumstances surrounding the violation, whether the violation was willful or through the carelessness or negligence of the purchaser, and the installation forester's recommendations. Deficiencies will be brought immediately to the attention of the purchaser's designated field superintendent with directions for necessary corrective action. At no time will the inspector give instructions concerning deficiencies or violations to other than the purchaser or the purchaser’s field superintendent unless such deficiency or violation is of such a nature that immediate remedial action is necessary. The Contracting Officer’s representative will check all contract violations as they are reported to have a firsthand knowledge of the violation as it happened in the field. On major or repeated violations, the Contracting Officer’s representative will inform the purchaser in a brief, concise, courteous letter of the existing violation and how it shall be remedied. The Contracting Officer’s representative will be advised of all major or repeated violations with recommendations for involving penalties. Information on decisions will be promptly furnished to the installation forester. Security of forest products is another prime factor in good contract administration. It is of primary importance because without adequate security there would be no satisfactory way to determine the amount of timber products removed from an installation. Good security not only provides for protection of government property, but reflects the integrity of the government employees engaged in timber sales. The installation foresters are responsible at the field level, as part of their contract administration, to conduct a vigorous and continuous security program.

### 13. Contract Completion and Closure

Completion dates are designated on the Timber Availability Report and will be made part of the contract. Timber sale contracts generally last for a period of 18 to 24 months. Any changes in the assigned completion date will be coordinated with the installation forester and the Contracting Officer’s representative. Assigned completion dates will be made by the installation forester or Contracting Officer’s representative considering the following conditions: market conditions, military mission, contamination, logging conditions, silvicultural needs, and management objectives. The installation forester will inspect the area after all contracted forest products are removed. A satisfactory letter of clearance or final completion notice from the Directorate of Public Works will then be obtained for the entire area. The procedure gives opportunity for both the Directorate of Public Works and the installation forester to review areas and note the progress of harvesting without duplicating inspection trips. The completion notice will be forwarded to the Contracting Office. If any timber made available was left un-harvested in the sale area, its acreage and location, volume and species, and the reason why the timber was not removed will be reported. A separate report explaining the reasons for overcut and undercut should accompany the completion notice if the volume removed was more than plus or minus 10% of the volume made available.

### 14. Aids in Contract Administration

Listed below are points that will help the installation carry out more effective contract administration. The installation forester or Contracting Officer’s representative should adhere to the following guidelines. Recognize that timber contracts are legal documents and require compliance with all terms and conditions. Do not arbitrate or alter contract specifications to obtain a higher value for the government timber or for any other reason. Always recommend modifications to invitations or contracts to the Contracting Office. Induce compliance through an effective application of education and cooperation rather than through the exercise of police power. It is important to establish a good relationship with the purchaser. Approach the purchaser properly. Each one requires a different approach. Some are sensitive while others require planned approaches. If the purchaser has done good work, let the purchaser know about it. Be firm, fair and impartial with all operators. Discuss the problems quietly but confidently. Contracting Officer's representatives and installation foresters with reputations of firmness will command more respect and cooperation than one the operators feel they can sway and take advantage of. Recognize the importance of timing. The crucial times in the life of a contract are the pre-work conference with the purchaser to discuss terms and the start of the different phases of the operation. Follow-up at the beginning of each significant phase of operation will get work off to a proper start. Keep informed. Require employees to report field activities on different sales. Require "planned" timber removal from sale areas; ask the subcontractors about their activities; intelligent decisions cannot be made without knowing the facts. Problems can be minimized by anticipating likely areas of trouble before it is too late. Try to anticipate problems that may arise from changes in operator personnel, equipment breakdowns, weather changes, reduced quotas, and changes in market conditions.

### SC3.1.2 Timber Stand Improvement

Timber stand improvement activities are designed to improve the quality of forest stands, support military training activities, and improve wildlife habitat. Timber stand improvement is often categorized as noncommercial activities used to improve the quality of commercial timber, but it may also be used to improve forest conditions for other uses. Timber stand improvement may include thinning, spacing, chemical injection, chipping, prescribed burning, etc., all of which are designed to improve species composition, quality, and/or growth rate of existing stands by removing competing vegetation to allow preferred trees to grow faster. Timber stand improvement is also an effective treatment for wildland fire hazard fuel reductions and insect and disease control. Usable material from timber stand improvement projects will be disposed of through timber sales or the personal use firewood program.

### SC3.1.3 Firewood/Personal Use

The Firewood/Personal Use program consists of Christmas tree cutting, house log harvesting, and firewood cutting. Christmas tree permits are free and available starting December 1 each year. Designated cutting areas vary year by year. The topping of larger trees is not allowed, nor is cutting trees over 15 feet tall. House log harvesting is allowed in designed areas by permit. Up to five permits may be issued annually. Permits are issued on a first-come basis starting the first working day of January each year. The permit is good for two years and allows the permit holder to cut up to 50 trees. The permit fee is $1,000 paid at time of issue. Tree cutting must adhere to all regulations applied to timber sales. Firewood permits are sold for five dollars a cord with a three-cord minimum and five dollars for each additional cord. Areas to be cleared or thinned for military training, construction, and habitat enhancement are selected for cutting; consequently, available volume will vary year by year depending on the amount of clearing and thinning. Long-term designated firewood cutting areas are established in several training areas. These areas undergo extensive environmental review and are subject to the same stipulations as timber sales. Firewood permits are available year-round and expire one year after the date of acquisition. Personal use permits for firewood, Christmas trees and house logs are made available for military personnel, their families, and local residents. The Firewood/Personal Use program is designed to utilize material to be cleared for military mission support and to offset clearing costs.

### SC3.1.4 Reforestation

The objective of the forest regeneration program is to quickly reestablish trees on cleared and harvested sites. Regeneration of forests, either naturally or artificially, is an essential part of forest ecosystem development. A regeneration plan is required for each harvested site as part of the forest land use plan, unless the area is to be converted to a non-forest condition or the stand is composed of insect and disease-killed trees, fire killed, wind thrown, or fatally damaged trees. Exempt stands from regeneration plans must be approved on an individual basis from Natural Resource personnel with a written explanation for exemption. In areas exempted from reforestation requirements, existing reproduction must be protected from damage where feasible. Decisions will be made whether to try to guide future forest development through planned regeneration or to allow natural conditions and processes to prevail.

The first step in establishing trees on a site is the preparation of the seed/planting bed. The reduction of competition from existing plants, allowing sunlight to reach the ground, and exposure of mineral soil is critical in the establishment of trees. Scarification and prescribed fire are effective techniques for site preparation. Distance from seed source should not exceed 200 feet for white spruce and 400 feet for hardwoods (Table SC3.1). Coppice, vegetative reproduction, is an effective method for regenerating hardwoods on sites previously occupied by hardwoods. Artificial regeneration of forests occurs in limited instances when sites need to be reclaimed quickly, natural regeneration has failed or needs to be supplemented, and when target tree species for a site cannot be established by natural regeneration. Seed source and seedlings for artificial regeneration should come from genetic stock originating from the area to be planted and follow guidelines set forth in the *Provisional Tree Seed Zones and Transfer Guidelines for Alaska* (Alden 1991). Only appropriate tree species for a specific site will be planted with emphasis given to native species. Natural regeneration is mostly relied upon following harvest and other disturbance activities. Table SC3.1 lists acceptable reforestation methods for major tree species.

Reforestation plans are to be developed for sites regenerated after harvest or disturbance. A reforestation plan outlines the objective of the regeneration project and additional treatments needed if the objective is not being met. The plan defines site preparation, regeneration technique, seed/seedling source, planting technique, spacing, and target stems per acre at maturity. The plan discusses the stand type and composition to be achieved at the target year. Stand maintenance/improvement treatments are outlined. Natural Resource staff will periodically conduct site visits to ensure minimal regeneration standards and the objective of the reforestation plan is met. The reforestation plan is a part of the forest land use plan.

Minimal regeneration standards adopted from the State of Alaska's Forest Practices Act should be followed. Land must be reforested seven years after harvest. The number of vigorous, well-distributed residual trees free from significant damage, or a combination of trees and seedlings, must average a minimum of 450 trees per acre and must have survived on site a minimum of two years. No more than 10% of the harvest area or contiguous areas may be below the stocking level. To determine residual tree stocking levels, first estimate the number of residual trees that will be left after timber harvest in each size class. Then divide, by size class, the number of stems per acre needed to meet the minimum stocking standard into the estimated number of trees per acre left after harvest and multiply by 100 to determine stocking percentage. Percentages from each size class are then added to determine overall residual stocking levels. An example is provided in Table SC3.2.

Table SC3.1. Probability of success by recommended reproduction methods (Shively 2000).

| **Species** | **Artificial** | **Natural** | | |
|---|---|---|---|---|
| | Planting | Seeding | Seeding | Sprouting |
| Spruce | High (Note 1) | Low (Note 2) | Medium (Note 3) | |
| Birch | | | High (Note 1) | Medium (Note 2) |
| Aspen and Balsam Poplar | | | Medium (Note 1) | High (Note 2) |

Notes:
For spruce

- Plant immediately following harvest or site preparation.

- Spot seed on mineral soil seedbed; site preparation recommended.
- Seed is only available every 3 to 5 years depending on cone crop; mineral soil seedbed and seed source within 200 feet is required.

For birch

- Mineral soil seedbed required with seed trees within 400 feet.
- Sprouting is unreliable for trees over 70 years.

For aspen and balsam poplar

- Mineral soil seedbed needed.
- All stems in clone should be cut; leave uncut 15+ native stems/acre if it is desired to minimize sprouting.

Table SC3.2. Residual stocking calculation.
Example Residual Stocking Table

| **Average DBH** | **Estimated Number of Residual Trees per Acre** | **Minimum Stocking Standard** | **Stocking percentage** |
|---|---|---|---|
| >9" | 20 trees | 120 trees/acre | 17% |
| 6"-8" | 30 trees | 170 trees/acre | 18% |
| 1"-5" | 60 trees | 200 trees/acre | 30% |

Residual Stocking %age = 65% Total

*Determination of Minimum Seedling Requirements*
In the example above with 65% residual stocking, 158 additional tree seedlings per acre will be needed to satisfy the minimum stocking requirement. This is determined by multiplying the minimum 450 trees/acre times the balance stocking %age of 35% to achieve the minimum stocking level. The required number of seedlings may be achieved through natural regeneration, planting, or artificial seeding and must have survived on site a minimum of two years within seven years of harvest.

Example of a Residual Stocking Calculation Table

| Average DBH | Estimated Number of Residual Trees per Acre | Minimum Stocking Standard | Stocking %age |
|---|---|---|---|
| >9" | __trees | 120 trees/acre | __% |
| 6"-8" | __trees | 170 trees/acre | __% |
| 1"-5" | __trees | 200 trees/acre | __% |

Residual Stocking %age = __% Total

Seedlings Required
%age Understocked: 100 - ______ Residual Stocking %age = ________
%age Understocked ______ x 450 = Seedlings/Acre

### SC3.1.5 Urban Forestry

The National Arbor Day Foundation, in cooperation with the United States Department of Agriculture, Forest Service and the National Association of State Foresters, recognizes towns and cities across

America that achieve the standards of the Tree City USA program. The Tree City USA program is designed to recognize those communities that effectively manage their public tree resources, and to encourage the implementation of community tree management based on four Tree City USA standards. These four standards provide structure for a community forestry program, require that a program demonstrate success based on the judgment of the state forester's office, and provide for an awareness and appreciation of trees among the residents of the community. The four standards are: establish a Tree Board which consists of representatives from the Natural Resource offices, with the installation forester serving as the lead; develop and follow a Community Tree Ordinance; a minimum of $2 per capita must be spent annually on the Community Forestry Program; and Arbor Day must be observed annually with media coverage and a proclamation must be given by the Post Commander.

The Tree Board Ordinance (USAG-AK 2002), in accordance with Army Regulation 200-3 - *Natural Resources-Land, Forest and Wildlife Management,* and other applicable regulations, establishes policies and standards for the planting, maintenance, and protection of trees in the Fort Wainwright and Fort Richardson community forest, to include the cantonment area, travel corridors and established recreation areas. There will be a conscious and active concern for the inherent value of trees in all installation plans, decisions, actions, and programs. The provisions of this document are enacted to maintain urban trees in a healthy and non-hazardous condition through good cultural practices, and to establish and maintain diversity in tree species and age classes to provide a stable and sustainable community forest. Along with the Tree Board Ordinance, Fort Richardson and Fort Wainwright also have developed landscape management plans (U.S. Army Garrison Alaska, 2005; Baxter 2005). Landscaping is the responsibility of the Directorate of Public Works (Directorate of Public Works) in accordance with AR 200-3, DA Pam 420-7, TM 631, the Integrated Natural Resource Management Plan, and utilization of the Installation Design Guide. These plans present the user with information regarding procedures for landscape planting on the cantonment areas and provide principles and techniques for maximum benefit and beautification. Although not a complete list, those plants are known to grow and survive in Alaska's climate. Many of the trees and shrubs listed, particularly those native to interior Alaska, will require minimal maintenance once they are well established in their new environment. All landscaping efforts at Fort Wainwright should concentrate on establishing plants grown in Alaska north of the Alaska Range. Attempts at unproven exotics should be avoided. Handling and planting techniques described within this text are standard practices and if properly employed will limit plant mortality rates to an acceptable level. Design principles should complement existing vegetation and strive for a more informal and natural look.

### SC3.1.6 Forest Health

Annual insect and disease detection surveys are conducted by the United States Department of Agriculture, Forest Service in cooperation with the State Department of Natural Resources, Division of Forestry. Continuous forest inventory plots are used to detect changes in insect and disease abundance in representative forest stands across the landscape. Prevention is the primary approach to insect and disease control in intensively managed sites. Prevention will consist largely of silvicultural practices that enhance natural control of insects and diseases and removal of infested trees. Salvage timber sales can be used in stands with large outbreaks. Stands suffering extensive damage from snow and ice loading and windstorms will be targeted for salvage sales to prevent insect infestation and resulting outbreaks. Management actions may not be necessary in some areas where natural disturbance from forest insects and diseases is acceptable. Slash management for spruce trees and/or limbs greater than four inches in diameter will be accomplished by utilizing the wood and removing it from site, burning, or dried by uniform scattering in areas open to sunlight (limbs only). Monitoring for insect outbreaks will follow guidelines established by U.S. Forest Service, State and Private Forestry's Forest Health Protection Unit. Procedures include establishing bait and trapping sites and systemically identifying infected trees. Control procedures will be identified by the Forest Health Protection Unit and include bio-control, mechanical removal, and chemical control techniques.

### SC3.1.7 House Log Program

In recent years there has been growing interest from the public to harvest house logs in the Tanana Flats Training Area of Fort Wainwright. USAG-AK has initiated a house log program in response to public request. The program closely follows guidelines set by the State of Alaska Division of Forestry's House Log Program. The Division of Forestry's House Log Program was discontinued due to lack of funding.

House log harvesting is allowed in designed areas by permit. Four permits will be issued for the Tanana Flats Training Area and one permit will be issued for Donnelly Training Area West. Permits for the Tanana Flats Training Area are allocated within three units. Unit 1 consists of the area along the Wood River and along the Tanana River downstream of Crooked Creek. Unit 2 consists of the area along the Tanana River down stream of Willow Creek up to Crooked Creek. Unit 3 consists of the area starting at the boundary of Tanana Flats Training Area across from Flag Hill and proceeding downstream to the upstream start of Salchaket Slough along the Tanana River. The unit located in Donnelly Training Area West goes from the Delta River to Delta Creek and lies north of the impact areas. Permits are issued starting the first working day of January each year. Permits are issued at the Environmental Resources Department located at Fort Wainwright. Permits are issued on a first-come-first-serve basis. Personal use permits for house logs are made available for military personnel, their families, and local residents. The permit holder must also obtain a USAG-AK Recreation Access Permit and any necessary Bureau of Land Management permits. The USAG-AK permit fee is $1,000 paid at time of issue. All monies collected are to be deposited in the Army's Forestry Reserve Account. The permit is good for two years and cannot be extended. No more than five permits can be active at any time. The permit allows the holder to cut up to 50 trees. The permit holder must select a site. All trees to be cut must come from the selected site. The selected site cannot exceed 5 acres in size. The permit holder must identify the site on a map and present the map to Environmental Resources Department forestry staff. The permit holder and Environmental Resources Department forestry staff will visit the site together and lay out travel routes. The permit holder must also notify Environmental Resources Department forestry staff of the method of cutting and hauling trees from the selected site. The permit holder must notify Environmental Resources Department forestry staff at the start of house log harvesting and completion. The forestry staff will flag and map the boundaries of the selected site prior to any cutting. The site will also be periodically inspected during harvest to ensure environmental compliance. If extensive environmental damage is found to have occurred, the permit will be revoked. Any activity in wetland areas must occur in winter. No ground-disturbing activities will be allowed. House log harvest activity is not allowed within 50 feet immediately adjacent to an anadromous stream or high value resident fish water body. Within the next 50 feet, a 50% minimum retention of trees must occur. Permits are required for the vehicular crossing of anadromous and resident fish streams. Permits can be obtained from the State of Alaska Department of Natural Resources. If spruce logs are to remain on site over summer, the following special precaution must be taken. All spruce logs greater than four inches in diameter must be scored the length of the log with a chainsaw to a half-inch depth so as to cause drying of the phloem to prevent bark and ips beetle infestations in nearby healthy trees. All stumps should be cut within six inches or less of the ground surface.

## SC3.2 Fire

Fire management includes standard practices and procedures for prescribed fire, fire suppression, fuel breaks, and wildfire incident coordination.

### SC3.2.1 Use of Prescribed Fire

Prescribed burning is defined as the controlled application of fire under specified environmental conditions that allow the fire to be confined to a predetermined area while at the same time producing fire behavior required to attain resource management objectives. Because of the potential for unintended circumstances, extensive planning, coordination, and risk management must be completed prior to ignition of any prescribed burn. Prescribed burns also mimic the important ecosystem functions of wildfire while reducing risk to human environments and other resources. USAG-AK, in cooperation with the Alaska Fire Service, conducts prescribed burns on its installations to improve wildlife habitat, to decrease the potential for ignitions and fire escape from live firing, and to increase the size of military training areas.

The Army recognizes two types of prescribed fires: (1) those ignited by qualified personnel in accordance with an approved prescribed burn plan, and (2) wildfires managed under prescribed conditions as addressed in an approved Integrated Wildland Fire Management Plan.

The opportunity to conduct prescribed burns in Alaska is usually limited to May, between snowmelt and spring growth of plants. Often this period is very wet, which makes burning difficult. Fall is another time of the year when burns can be accomplished, but the burning window in the fall is narrower due to weather and personnel constraints. Another limiting factor is that winds must be low to prevent smoke from entering urban areas. The Alaska Fire Service prepares the burn plans for USAG-AK. These plans are used to evaluate conditions and minimize the risks associated with prescribed burning.

#### *SC3.2.1.1 General*
Prescribed burning is an effective and efficient means to reduce or prevent the accumulation of hazardous fuels, where permitted, and will be used as a recognized land management practice for natural resources management and fire protection. The decision to use prescribed burning will be based on the safety hazard involved, the hazard that will develop if burning is not accomplished, the type of natural habitat involved, the impact on the area’s total ecosystem, and applicable state and local regulations and coordination with installation fire departments (Army Regulation 200-3).

In the process of developing practical fuel reduction programs, fire managers will consider the use of prescribed fire. When applied in a safe, carefully controlled situation, it is often the most cost effective means of achieving management and natural resource objectives. Consideration will be given to prescribed fire to protect habitats, natural resources, and capital improvements as well as reduce hazardous fuels, construct and reinforce fuel breaks, and control alien plants. Well placed prescribed burning units can help prevent large wildfires or slow their advance.

Prescribed burning on Army training lands will only be executed by qualified individuals. A National Wildland Coordinating Group certified prescribed Burn Boss must supervise all prescribed burns. The Burn Boss has the responsibility to make the on-site, tactical “go/no-go” decisions. The Burn Boss ensures all prescription, staffing, equipment, and other prescribed burn requirements are met before and during the burn.

Individual prescribed burns are required to have plans and appropriate National Environmental Policy Act documentation prepared after coordination between the Bureau of Land Management/NFO, the Natural Resources Branch, and the Fort Wainwright Fire Department occurs. The Alaska Fire Service prepares the burn plans for USAG-AK. Burn plans are used to evaluate and minimize risks associated with prescribed burning and include how the fire will be set. At a minimum, burn plans will include the following:

- Burn objectives.
- Acceptable weather and fuel moisture parameters.
- Required personnel and equipment resources.

- Burn area map.
- Smoke management plan.
- Safety considerations.
- Pre-burn authorization/notification checklist.
- Coordination to consider wildlife, endangered species, cultural resources, and noxious weed effects.
- Alternative plan to cover plan of action if wind direction changes during prescribed burn.
- Plan for analysis of burn success and identification of lessons learned.
- When planning for prescribed fires, and when suppressing wildfire, utilize natural and existing man-made features whenever possible. Firebreaks must be constructed, maintained, or rehabilitated to prevent erosion.

The prescribed burning window is very narrow, particularly during spring between loss of snow cover and green-up, usually occurring in May. Often this period is very wet, which makes burning difficult. Fall burns are another option, but the weather window is very narrow and resource availability is limited. In addition, winds must be such that they do not blow smoke into urban areas, which further narrows the window. It is difficult to long-range plan prescribed burning due to weather, military training, and availability of resources. An air permit from the Alaska Department of Environmental Conservation is required for any burning as well as National Environmental Policy Act documentation.

#### *SC3.2.1.2 Objectives*

The primary objective is to use management-ignited or training-ignited prescribed fires in a safe, carefully controlled, and cost effective manner as means of achieving fire management objectives. Management-ignited prescribed fires, often referred to as simply "prescribed fires," are defined as intentionally set fires used to achieve a resource management objective. Training-ignited prescribed fires are defined as fires that are unintentionally started during normal military training, but are allowed to burn to achieve a predetermined resource management objective.

Prescribed fire may be used as a management tool to support mission needs and to attain the goals and objectives of the Integrated Natural Resource Management Plan, designed to implement the land management policies. Prescribed fires are used for silvicultural treatment of sites, preparation for reforestation, hazard fuel reduction, habitat enhancement, and insect and disease control. Prescribed fires are also used as a tool to reduce fuel loading on ranges where the risk of wildfire limits military training opportunities. Wildland fire escapement from impact areas is reduced through prescribed fires and mechanical treatments along the boundaries of impact areas. Burning often opens areas to additional military training options, particularly maneuvers that are hampered by dense cover.

#### *SC3.2.1.3 Procedures*

Prescribed burning consists of the following procedures. A Management-ignited Prescribed Fire Burn Plan must be completed for all prescribed burning projects in advance of ignition. A Training-ignited Prescribed Fire Burn Plan must be in place prior to any declaration of any training-ignited fire as a training-ignited prescribed fire. In the Prescribed Fire/Training-ignited Prescribed Fire Burn Plan, appropriate actions to take must be addressed if on-site conditions change and cause one or more prescription parameters to exceed acceptable limits. A prescribed fire that exceeds, or is anticipated to exceed, one or more prescription parameters and/or line holding capability must be declared a wildfire and cannot be re-delegated as a prescribed fire. At this point, appropriate suppression action must be taken.

Each prescribed fire must be conducted in compliance with the approved burned plan. Only trained and qualified personnel may be used to execute each prescribed burn plan. The number of resources required to safely achieve prescribed fire objectives must be based on the size and complexity of each project. Minimum manning will vary with the size and complexity of each prescribed burn. The Wildland Fire Program Manager must personally approve the Prescribed Fire/Prescribed Natural Fire Burn Plan and any changes. Only in the absence of the Wildland Fire Program Manager may this responsibility be re-delegated.

When planning for prescribed fires, and when suppressing wildfire, utilize natural and existing man-made features whenever possible. Firebreaks must be constructed, maintained, or rehabilitated to prevent erosion. When the burn prescription window is open, crews assemble at the burn unit. The edge of the burn unit is lit using hand lighting or aerial lighting techniques. Roads, trails or changes in vegetation types surround burn units and these features are utilized as fire lines. Next the interior of the unit is lit using hand lighting or aerial lighting techniques. The interior is lit using a systematic grid pattern. The mop-up process starts after the entire unit is lit. Mop-up consists of extinguishing all hot spots within a specified distance from the burn perimeter. During mop-up, burning trees and shrubs are cut down and extinguished. Smoldering sites are dug up with hand tools and extinguished. Water is applied on an as-needed basis during mop-up either by backpack pumps, draft pumps, fire engines, or helicopter buckets. The final process involves monitoring the burn unit until the fire is completely out; this process can take anywhere from several days to several months. The Bureau of Land Management Alaska Fire Service, State of Alaska, Division of Forestry, or the USAG-AK Fire Department working with the USAG-AK Natural Resource Office prepare burn plans and implement prescribed fires.

#### *SC3.2.1.4 Prescribed Fire Ignitions*
Two types of ignitions are recognized on USAG-AK lands: management ignition, resulting in a management (deliberate)-ignited prescribed fire, and training ignitions, resulting in training-ignited prescribed fire.

Determination of prescribed fire complexity shall be based on an assessment of technical difficulty and potential consequences. Complexity shall be used to delegate approval authority, set standards for personnel staffing and skill requirements, and to determine the level of burn plan detail. Prescribed fire projects should be classified as Complex, Intermediate, or Basic. Burn complexity will be determined by the Wildland Fire Program Manager and shall be made in the context of existing or potential social, political, economic, biological, and/or legal consequences.

Complex prescribed fires are defined as those where prescribed burning occurs under particularly challenging conditions and/or constraints. This classification includes prescribed fires where the difficulty of achieving resource management objectives is high, or where the consequences of project failure may be serious. All training-ignited prescribed fires shall be classified as complex fires. Intermediate classification includes prescribed fires where the difficulty of achieving resource management objectives is not particularly high or complicated, and where the consequences of project failure are less serious and can be mitigated. Prescribed fires of basic complexity are defined as those where few constraints, other than the normal prescription parameters, exist. This classification includes prescribed fires where achieving resource management objectives is routine and the probable consequences of project failure are low.

#### *SC3.2.1.5 Prescribed Fire Burn Plan Requirements*
A prescribed fire burn plan shall be completed for each management-ignited prescribed fire. Prescribed burn plans describe expected results and the conditions necessary to achieve them as part of a vegetation management program. It shall include all items outlined below. The detail needed should be commensurate with project complexity. If a given item is not applicable, it should be so indicated in the plan.

- A description of the burn unit's physical location, including a map.
- Identification of resource management objectives to be accomplished by the prescribed fire.
- Desired effects and tolerable deviations.
- Prescribed fire management of vegetation on Army training lands requires an understanding of the type, age class, condition, availability, and arrangement of the fuel that can impact the natural resources, structures, and soils. All prescribed burns must have measurable objectives. Monitoring must occur before and after each prescribed fire to document and verify that the stated objectives have been met.
- Project area description that includes unit and fuel descriptors.
- A fire prescription containing those key parameters needed to achieve desired results (i.e., acceptable fire behavior, acceptable limits of environmental elements) and provisions to record on-site conditions.
- The range of acceptable results expected, expressed in quantifiable terms.
- Prescribed burn plans shall include the following smoke management components: Actions to minimize prescribed fire emissions, evaluate smoke dispersion, public notification, air quality monitoring, and exposure reduction precautions. The Army fully supports the Clean Air Act (1967) and amendments to the Act (1972, 1977) to protect and enhance the quality of national air resources and to protect public health and welfare. The Army will comply with all applicable State of Alaska and local laws pertaining to prescribed burning and the acquisition of appropriate burning permit(s).
- Provisions for weather data collection, acceptable parameters, and forecasts.
- Provisions for public safety and protection of sensitive features.
- Provisions for inter/intra agency pre-burn coordination and, where applicable, public involvement and burn day notification to appropriate individuals, agencies, and the public. Prescribed burn plans will be coordinated with directorates to include: Bureau of Land Management Alaska Fire Service; Directorate of Public Works; USAG-AK Fire Department; Staff Judge Advocate; the Assistant Chief of Staff, G3, Directorate of Plans, Training, & Mobilization; and Installation Range Office. Technical experts from outside agencies (i.e., U.S. Forest Service, National Park Service, and State of Alaska, Division of Forestry) may review the Army's prescribed burn plans.
- Identification of the level of complexity of the fire and the appropriate organization needed. No less than the organization described in the approved plan shall be used to execute the burn. Minimum requirements for skill/knowledge element ratings of all elements of each position listed shall be stated. Describe the duties and responsibilities of positions within the organization.
- A communication plan.
- Provisions for line construction, pretreatment, and holding actions to keep the fire within prescription. Firing techniques, containment, patrols, and mop-up procedures are required. Holding actions must be defined in the prescribed burn plan. The burn plan will allow the Burn Boss to take limited holding actions on fires outside the planned perimeter. However, there must be defined limits in the amount and kind of holding that can be done before any fire is determined to have exceeded the approved plan and must be declared a wildfire. The limits of acceptable holding actions must be clearly stated in the prescribed burn plan. These limits must be defined as specific actions that can be taken, not general terms. If a prescribed burn accidentally crosses the prescribed perimeter, immediate action by the holding crews must be taken to control it.
- Identification of contingency actions to be taken if the fire exceeds prescription parameters and/or line holding capabilities and cannot be returned to prescription with project resources. If the fire exceeds the predetermined and pre-approved constraints on holding actions, the fire must be declared a wildfire and appropriate fire suppression action taken. If a single spot fire

escapes, it may be designated as a separate fire. If additional suppression forces are needed, the spot fire is declared a wildfire. The prescribed burn may continue as long as adequate holding forces remain on the prescribed burn as specified in the prescribed burn plan, separate from the suppression action on the spot fire, and the burn remains in prescription. In no case should the capability to hold the prescribed burn be jeopardized by moving essential holding forces to fight a spot fire.

- A risk assessment that portrays an estimation of the probabilities and consequences of success/failure to the approving official. A safety plan and a "go/no-go" checklist are required.
- Provisions for fire proximity to endangered species and plant boundaries; consideration of existing and predicted weather, fire behavior, and fuel conditions; and drought evaluation impact and/or effect.
- The source of funding and estimated costs.
- Provisions for a test fire and recording the results.

A site specific Training-ignited Prescribed Fire Burn Plan is required for each training-ignited prescribed fire. This plan will be developed and approved prior to declaration of any fire as a training-ignited prescribed fire. The only location that training-ignited prescribed fire will be allowed within USAG-AK is within the impact areas. No other locations are suitable for use of this designation. Training-ignited prescribed fire will not be allowed during "Extreme" fire danger. Only the Fire Department Chief or the Bureau of Land Management Wildland Fire coordinator may designate a fire as a Training Initiated Prescribed Fire. Fires must be designated as a training-ignited prescribed fire within four hours of ignition. No more than one training-ignited prescribed fire will be allowed within each impact area at any given time. Once developed, the pre-existing plan will be approved by the Wildland Fire Program Manager. The programmatic elements of the Training-igniteded Prescribed Fire Burn Plan shall include the following:

- General description of the area, history (including fire history), and map.
- Objectives to be achieved by the training-ignited prescribed fire and identification of acceptable outcomes.
- Required skills, qualifications and organization necessary to implement and manage the training-ignited prescribed fire program.
- Funding requirements.
- Inter/intra-agency coordination, including joint planning and review where fires may cross multi-agency boundaries.
- Program "Inform and Involve" actions both internally and externally. Include program planning as well as execution.
- Potential impacts of plan implementation including environmental, on/off site, socio-economic, and political impacts.
- Analysis and decision process that provides for identification of local approval authority, identification of evaluation criteria for the initial "go/no go" decision, a risk assessment that considers, at a minimum, fire growth predictions; threat to life and property; smoke management concerns; local/regional/nation fire situation, including availability of resources; potential impacts on endangered species and plants; fire proximity to endangered species and plant boundaries; assessment of the amount of training-ignited prescribed fire that is acceptable and manageable; consideration of existing and predicted weather, fire behavior, and fuel conditions; and drought evaluation impact and/or effect, provision for daily revalidation, and timely decision by the Wildland Fire Program Manager.

- Identification of fuel treatment measures needed to reduce hazard fuels in support of the Army's prescribed fire program, including identification of areas or developments that need protection from fire.
- Process for development of a Training-ignited Prescribed Fire Plan.
- Process for monitoring and evaluating the training-ignited prescribed fire.
- Escaped Fire Situation Analysis and contingency plan.
- Identification of maximum allowable perimeter.
- Monitoring actions to assure accurate and timely information on fire behavior, location, etc.
- Evaluation Plan for assessing outcome of the fire.

Some information will not be known until a training-ignited prescribed fire actually starts. Individual Training-ignited Prescribed Fire Burn Plans shall also include holding actions necessary to keep the fire within prescription, fire projections using both "expected" and "most severe" weather scenarios, an estimate of resource needs to manage the fire and cost estimates to manage the fire.

#### *SC3.2.1.6 Prescribed fire organization*

A Burn Boss, experienced with local weather, fire behavior, fuels, and terrain conditions, shall personally supervise the burning operations on each management-ignited prescribed fire. More complex burns may require an Ignitions Boss and a Holding Boss. A Prescribed Fire Manager qualified to manage prescribed management-ignited and training-ignited prescribed fires shall personally supervise operations. Every management-ignited prescribed fire requires the performance of the duties shown in these standard operating procedures. On smaller or less complex projects, one person may perform more than one of the required duties. Larger or more complex projects will require more qualified people to perform necessary duties.

The Prescribed Fire Manager will determine, through the development of the Training-ignited Prescribed Fire Burn Plan, the organization, expertise, and positions necessary to manage the prescribed natural fire. The organization required varies with the size and complexity of each prescribed fire. In the event of an escape, use personnel qualified under National Interagency Fire Qualification Handbook standards (National Wildfire Coordinating Group Guide 310-1) to accomplish the required suppression activity. The temporary use of personnel who do not meet these qualifications is appropriate for prescribed fires that escape and are declared wildfires.

The Prescribed Fire Planning Specialist develops the prescribed fire burn plan for each management-ignited or training-ignited prescribed fire. The Prescribed Fire Planning Specialist may determine by the complexity or number of prescribed fires that a Prescribed Fire Manager is necessary. On management-ignited prescribed fires, the Burn Boss is responsible directly to the designated Prescribed Fire Manager for implementation and coordination of the assigned prescribed fire activities. The Prescribed Fire Manager shall:

- Coordinate and schedule the ignition and management of two or more management-ignited prescribed fires, or the management of a single training-ignited prescribed fire.
- Develop and implement the Training-ignited Prescribed Fire Burn Plan on appropriate training-ignited fires.
- Coordinate personnel and equipment requirements, including resources called for holding actions and contingency action section of the burn plan.
- Ensure appropriate public notice is given prior to and during the prescribed fire activity.
- Coordinate prescribed burn projects to avoid exceeding holding and contingency capabilities.
- Monitor prescribed burn projects to ensure that all plan requirements are being met.

- Record and report costs and accomplishments and recommend improvements to the Wildland Fire Program Manager.

The Burn Boss has direct responsibility for on-site implementation of specific actions in strict compliance with the approved prescribed burn plan. The Burn Boss is accountable to the Prescribed Fire Manager. The Burn Boss has the following responsibilities that cannot be re-delegated:

- Ensuring safety of personnel.
- Supervise all operations on the project site.
- Ensure that all prescribed fire burn plan requirements are met and that personnel are briefed before proceeding with ignition.
- To make the decision to proceed, accelerate, defer, or curtail operations based on attainment of the approved prescription criteria or lack thereof, including daily validation of prescribed criteria on multi-day projects.
- Ensure that the fire prescription is met before proceeding with ignition.
- Ensure that the forecast on-site weather parameters are within prescription at the time of ignition and predicted to remain so during the expected life of the burn.
- Ensure the availability of suppression resources in the event the prescribed fire escapes and is declared a wildfire.
- Control directly, or through supervision of Ignitions Bosses, the method, rate, and location of firing.
- Maintain immediate and clear communications with the Ignitions Boss and Holding Boss at all times.
- Monitor fire behavior and terminate operations if fire behavior or effects are not according to prescription.
- Accomplish mop-up to predetermined standards in accordance with the prescribed fire burn plan.
- Certify that the fire is out.

The Ignitions Boss reports to the Burning Boss. The Ignitions Boss will maintain control of the ignition sources, including aerial ignition, on the burn project at all times, ensure deployment, sequence, and timing of all ignition sources to meet project objectives, supervise assigned personnel and ensure their safety, maintain immediate and clear communications with the Burning Boss and Holding Boss at all times, and if aerial ignition is used, ensure that the aerial ignition pilot is briefed on the Job Safety and Health Hazard Analysis, with emphasis on aerial flight hazards.

The Holding Boss reports to the Burning Boss on management-ignited prescribed fires. On prescribed natural fires, the Holding Boss may report directly to the Prescribed Fire Manager. The Holding Boss shall confine the prescribed fire within the planned area, take action when fire exceeds, or has the potential to exceed, the planned area, confer with the Ignitions Boss, Burning Boss, Prescribed Fire Manager, as appropriate, to match holding and contingency capability with firing sequence, supervise assigned personnel and ensure their safety and maintain immediate and clear communications with the Burning Boss, Ignitions Boss, or Prescribed Fire Manager, as appropriate, at all times.

### SC3.2.2 Fire Suppression

Wildfire suppression is conducted by the Bureau of Land Management, Alaska Fire Service and/or the military fire department. The State of Alaska, Division of Forestry may be called upon for assistance as well as local fire departments. Alaska Fire Service is responsible for wildfires on USAG-AK lands in exchange for use of the facilities at Fort Wainwright (Support Agreement Alaska Fire Service / U.S.

Army Alaska, 1995). Suppression operations are undertaken on lands with fire management options of critical, full and modified or as requested by the wildfire or land managers. Wildfire on lands with a fire management option of limited are regularly monitored. Suppression actions consist of using the following resources: fire engines, dozers, saws, hand tools, pumps, aircraft and backfiring.

### SC3.2.3 Fire/Fuel Breaks and Trenches

Fire fuel breaks/trenches establishment consist of the following procedures. Breaks can be created using hand thinning or tree removal techniques mentioned in the hand thinning section. Hand line/trenches may be dug to mineral soil using hand tools. Fuel breaks created with hand thinning are usually 15 - 120 feet wide. Breaks can be created using dozers with shear-blades and or straight blades. Vegetation is sheared or pushed over and windrowed or pushed into piles. The duff and or organic matter are rolled up into the windrows or piles to expose mineral soil. Piles and windrows are burned following stipulations outlined in a burn plan. The soil may then be disked creating furrows to enhance hardwood and shrub re-vegetation. Fuel breaks created with dozers are usually 15 - 30 feet wide. Breaks can be created using hydro-axes with masticating and rotary blades. Vegetation is chopped up into pieces. Masticating heads incorporate vegetation with the duff and organic layers of the soil. The soil may then be disked creating furrows to enhance hardwood and shrub re-vegetation. Fuel breaks created with hydro-axes are usually 15 - 30 feet wide.

### SC3.2.4 Wildfire Incident Coordination

Wildfire suppression is conducted by the Bureau of Land Management, Alaska Fire Service and/or the military fire department. The State of Alaska, Division of Forestry may be called upon for assistance as well as local fire departments. Wildfire suppression follows the incident command system (Fireline Handbook 2004). The incident commander is responsible for suppression and management of a wildfire. The military zone of Alaska Fire Service is dedicated to the management of wildfires on USAG-AK lands. The USAG-AK Fire Chief is responsible for all fires and must be informed of the status of new and on-going wildfires (Support Agreement Alaska Fire Service/U.S. Army Alaska, 1995). G3 Range Control is the land manager and must be informed of the status of new and on-going wildfires (Support Agreement Alaska Fire Service/U.S. Army Alaska, 1995). The USAG-AK Installation Forester acts as the resource advisor and is a liaison between the fire management staff, the Fire Chief and G3 Range Control.

# SC4 Fish and Wildlife Management

The following section describes standard procedures and processes used to manage fish and wildlife on USAG-AK lands.

## SC4.2 Wildlife Management

Wildlife management on USAG-AK lands consists of managing wildlife harvest and habitat management.

### SC4.2.1 Wildlife Harvest

#### *SC4.2.1.1 Fort Wainwright*

Fish and wildlife management on Fort Wainwright is structured on a theory of game management which supports outdoor recreational activities including hunting, trapping and fishing. These three significant outdoor activities are important on Fort Wainwright. Hunting and trapping on Fort Wainwright is very important to military personnel and civilians in Alaska. Angling on Fort Wainwright appears to be more important to the military community, reflective of better fishing opportunities at other sites throughout the state.

The Alaska Department of Fish and Game and Fort Wainwright Natural Resources Branch jointly monitor fish and wildlife inventories, habitat and trends that were developed specifically for the ecosystem in the interior of Alaska. Fish and wildlife are monitored to ensure the most favorable conditions exist for sustained growth and reproduction to ensure optimum harvest levels and protection of all species. Hunting, fishing, and trapping on Fort Wainwright are regulated by state statute under the authority of the Alaska Department of Fish and Game. Military personnel collect data on harvest of game and furbearers on military posts and share this data with the Alaska Department of Fish and Game to assist in the regulatory decision making process. Natural Resources also work closely with Law Enforcement Command who provides enforcement of military, state and federal regulations. Law Enforcement Command also provides vital field information important to fish and wildlife management.

Trappers on Fort Wainwright are required to register their traplines. At the season’s end, trappers are required to provide a harvest report to Natural Resources. Army personnel monitor harvest levels mainly through annual harvest reports and verbal reports from trapping participants. Trapping on Fort Wainwright is open in most areas with the exception of Main Post and specific sensitive areas designated as off-limits. The Yukon Training Area and Tanana Flats Training areas sustain the most trapping activity. Due to its close proximity to Fairbanks and it easy winter accessibility, trapping in the Tanana Flats Training Area continues to be done by a few trappers who fail to register their traplines or complete harvest reports.

Hunting on Fort Wainwright has seen significant increases from both military personnel and civilians. The 2004 and 2005 moose hunting seasons have seen a remarkable growth in hunting and moose taken due to the popular anterless moose hunt. The Alaska Department of Fish and Game had determined that approximately 19,000 moose live in Tanana Flats and has created a special season to lower the moose population. Thousands of hunters from throughout Alaska and the United States enter Tanana Flats to have a chance at harvesting a moose.

Hunting for both black and grizzly bears is also a popular activity on Fort Wainwright. Black bears are normally hunted over bait, and all hunters hunting over bait are required to register their bait stations with both Alaska Department of Fish and Game and Natural Resources. Hunters are required to return a harvest report, which is reviewed by military personnel to assist with issues related to wildlife management. Approximately 50% of those black bear hunters hunting over bait in the Tanana Flats Training Area fail to register their bait station with Natural Resources or fill out the required harvest report.

The majority of small game harvested is taken during the trapping season. Ruffed and spruce grouse are the most harvested small game species on Fort Wainwright. Drumming counts for ruffed grouse were conducted during the springs of 2003 and 2004. Increased surveying is necessary to improve management of ruffed grouse.

Additional outreach strategies need to be implemented to inform those intending on recreating on military lands of the required military access permit, phone-in USARTRAK system, and regulations related to outdoor recreation. An increased effort to educate recreational users will raise the compliance percentage and reduce conflicts between the military and community.

### *SC4.2.1.2 Fort Richardson*

Fort Richardson allows hunting for moose (by drawing permit only), small game, waterfowl and coyotes. Directorate of Public Works Conservation personnel coordinate with various agencies, including the Alaska Department of Fish and Game and U.S. Fish and Wildlife Service, to manage these hunts.

**Big Game**

The only big game animal that is legally harvested on Fort Richardson is moose. The Alaska Department of Fish and Game issues a mix of bull, cow, and either-sex tags in order to meet management objectives. In order to participate in these hunts, drawing permit winners must pay a conservation fee of $125, which goes into a special account that can only be used for wildlife conservation projects. Hunters must also demonstrate proficiency with their chosen weapon and attend a safety briefing. Conservation personnel or Military Police Conservation Officers check and collect data on each moose that is harvested. In addition to the Harvest Report hunters must turn in to Alaska Department of Fish and Game, Fort Richardson moose hunters must also turn in a base harvest report to Directorate of Public Works Conservation personnel.

**Small Game**

The principal small game animals harvested from Fort Richardson are snowshoe hare and spruce grouse. There are anecdotal reports of ruffed grouse being harvested on base, but no documented reports.

**Waterfowl**

Waterfowl hunting is allowed north of Eagle River.

**Furbearers**

There is no trapping on Fort Richardson. By state law, it is legal to harvest coyote, lynx, and red fox on base under a hunting license; however, Directorate of Public Works Conservation Personnel can limit this further. Currently, the only furbearer that can be harvested on base is coyote.

Currently there is no mechanism in place to track harvest numbers of small game, waterfowl or furbearers on Fort Richardson. The Conservation Branch has plans to develop and implement a small game harvest report in order to track these harvest numbers.

## SC4.2.2 Habitat Improvement

USAG-AK utilizes two primary methods of manipulating habitat: prescribed burning and mechanical removal of vegetation. USAG-AK also utilizes herbaceous and woody vegetation plantings in the cantonment area to improve habitat.

*Prescribed Burning*: Prescribed burning is beneficial to ecosystem maintenance because fire is an important component of the ecosystem’s development. Prescribed burning is also favored by the Bureau of Land Management. It is less complicated and a more natural means of vegetation removal than using timber harvest or other mechanical means.

*Mechanical Removal and Revegetation*: Mechanical means of habitat manipulation is another way to accomplish habitat management. Mechanical tools used to accomplish habitat management include commercial timber sales, timber stand improvement, firewood cutting, hydro-axe and military maneuver training. Habitat improvement areas are then planted with desired herbaceous species or left to revegetate naturally.

*Wildlife Habitat Improvement Plantings*: This component of habitat improvement includes management of the cantonment area that directly affects natural resources management. Routine ground maintenance on Fort Wainwright is accomplished primarily by Grounds Maintenance, Directorate of Public Works. The *Installation Design Guide* (Higginbotham/Briggs & Associates 1991), *Landscape Design Plan* (David Evans and Associates, Inc. 1987) and the *Fort Wainwright Landscape Design Plan* (Baxter 2005) provide information on using trees and shrubs for landscaping. Both documents provide lists of plant materials appropriate for use on Fort Wainwright.

This Integrated Natural Resources Management Plan does not include routine ground maintenance unless it is specifically designed for the benefit of natural resources. Natural resources personnel provide professional assistance for landscaping, particularly regarding species selection and care of the landscape.

Current habitat improvement actions will continue if this Integrated Natural Resources Management Plan is not approved and funded. However, no new habitat improvement actions will be prepared, updated, or implemented.

## SC4.3 Fisheries Management

### SC4.3.1 Fish Stocking

The Alaska Department of Fish and Game stocks Fort Wainwright, Donnelly Training Area, and Fort Richardson lakes through the Statewide Stocking Plan (Alaska Department of Fish and Game 2006). Alaska Department of Fish and Game annually stocks 5 lakes on Fort Wainwright, 16 lakes in the Donnelly Training Area and 4 lakes on Fort Richardson. The lakes are monitored and stocked through the state's fish stocking program. Fish harvest is mainly reviewed through annual Alaska Department of Fish and Game harvest reports. Due to the shallow nature of most on post ponds and winter kills, the levels of fish stock present are decided by the annual state fishing stocking program.

### SC4.3.2 Fisheries Harvest

Fisheries harvest is accomplished through the statewide fishing season. Individuals fishing on USAG-AK lands must comply with state regulations while fishing.

### SC4.3.3 Pike Removal

Water bodies visually confirmed to harbor pike (only Otter Lake thus far) are subject to a pike removal effort conducted by Army personnel. This activity requires a fish resource permit from the Alaska Department of Fish and Game. An attempt is made to begin the removal effort during the time period between ice-out and planned spring stocking by the Alaska Department of Fish and Game, but can occur throughout the summer.

The removal effort is currently confined to Otter Lake but may be extended to other water bodies as needed. Up to six variable mesh monofilament gill nets (120 feet long x 5 feet deep) are deployed from boats or canoes in likely spawning/rearing habitat within the littoral zone of Otter Lake. Net placement and configuration vary depending on local conditions but are generally set perpendicular to shore and in depths ranging from 2 feet to 10 feet. Data recorded at the time of each net deployment includes date, net location, weather, average depth across the net and water temperature. Deployment dates vary from early May to late August. Deployment times vary from mid-morning to early evening with fishing duration ranging from 10 minutes to 4 hours. Nets are continuously observed due to presence of loons and grebes and are checked multiple times throughout the day. Pike are flushed from shoreline hiding places and herded into nets by personnel in canoes.

All fish are removed during each net check to minimize attraction of non-target animals and are either immediately dispatched (pike) or revived and released (all other fish). Data regarding species and location of capture are noted. All pike are dispatched via a sharp blow to the parietal/frontal neurocranium. A gill arch on larger fish is then severed and the fish is allowed to desanguinate to maximize flesh palatability. All dispatched fish are then immediately placed on ice. All non-target fish are revived and released if possible[6]. As soon as practicable after harvest (usually within 2 hours), all fish of edible size and quality are eviscerated. Data regarding length, sex and spawn condition are noted as well as any other remarkable findings. All fish of edible size and quality are donated to a local charity. Fish deemed not edible due to size or condition, are donated to local schools for dissection.

Current removal efforts utilize gill nets but other methods including the use of hoop traps and electrofishing equipment may be employed in the future. Hoop traps, if deployed, will be in addition to the placement of gill nets but will be fished in a static manner for a longer period of time. Disposition of fish captured in the hoop traps will be the same as for those captured in the gill nets.

Up to two backpack electrofishing units may be employed on Fort Richardson to help find and harvest pike hiding in thick vegetation. Shocking of species other than pike will be minimized through careful observation of the treatment area combined with shocking cessation upon observation of non-target species. Disposition of fish harvested while electrofishing will be the same as for those captured in the gill nets.

## SC5 Outdoor Recreation Management

Most outdoor recreation management activities are the responsibilities of the Morale, Welfare and Recreation division of the Directorate of Personnel and Community Activities. However, trespass structure abatement program and removal of trespass structures remain the responsibility of natural resources.

### SC5.1 Trespass Structure Abatement Program

Beginning in the 1980s, the Army in Alaska began studying the encroachment of trespass structures on military lands. During an assessment of the problem it was determined that approximately 50 structures had been built on Fort Wainwright and Fort Greely training lands with additional structures continuing to be built.

The Army determined the continual presence of trespass structures hindered its ability to manage its training lands and jeopardized the future use of the land. Trespass structures located on Army controlled lands constitute a violation of Army Regulation 405-80 paragraph 2-11 and the U.S. Enclosure Act (23 Statute 321;43 U.S.C. 1061) an act to prevent unlawful occupancy of enclosures on public lands. An outcome of this determination was the decision to remove all trespass structures from Army lands in Alaska. A resolution to the trespass structure situation was the creation of the Trespass Structure Abatement Program. Public notice was made in June 1998 of the Army's intention to initiate the abatement of all trespass structures. The Trespass Structure Abatement Program began cleaning trash sites and removing structures in 1999 and continues to this date. Although the majority of the cabins have been

[6] Any non-target fish inadvertently killed are noted for reporting to Alaska Department of Fish and Game and donated to a local charity or school.

identified, knocked down and hazardous materials removed, additional work needs to be done to remove debris. The Army supports recreational use of its lands and therefore continues to find trespass structures and litter. This section will outline Trespass Structure Abatement Program policies /procedures.

Information relating to existing trespass structures and trash sites is learned from various sources including Army personnel, hunters, trappers and others recreating on training lands. Once a site has been identified, the abatement mission cycle is initiated and broken into three major portions: site recon, personal property removal, and structure demolition/removal. The structures are also rated and placed in categories:

- "A" : Trash piles, lean-tos, and tree stands.
- "B" : Medium sized, with moderate amounts of personal property. These structures are generally constructed of natural/rough materials.
- "C" : Structures made mostly of man-made/refined building materials. These structures have moderate to high amounts of personal property and may in some cases even be suitable for year - round inhabitation. These structures have numerous creature comforts and area improvements (docks, outhouses, etc.).
- Most existing sites fall in categories "A" and "B", the majority being in category "A". Category "A" sites normally consist of trash piles and simple structures–generally wood frame and covered with tarps or inexpensive materials and lacking personal property. Category "A" sites are usually torn down and disposed of by Natural Resource and Conservation Office staff.

Category "B" and "C" structures require a more complex and thorough response from a team that may include Hazardous Materials, Environmental, Property Disposition, Public Affairs and Law Enforcement Command. A summary of responsibilities for each department follows:

Public Affairs:

- Respond to all community inquiries regarding these operations.
- Provide a photographic record.
- Coordinate all press releases, especially the property announcements with the post legal office.
- Ensure that a legal notice which includes inventories of all property removed from structures is put into the local media within 3 days of the property being removed from the structure.
- Coordinate with the Provost Marshal's Office and Staff Judge Advocate.

Directorate of Public Works:

- Provide personnel for all initial surveys to identify environmental and HAZMAT issues.
- Provide a representative for the personal property disposition board (real property).
- Provide fire department personnel for safe burning if a controlled burn technique is utilized.
- Responsible for removal of Category "A" structures.
- Provide needed signage for abatement program.

Law Enforcement Command:

- Provide a representative for personal property disposition board.
- Provide mission leader and team for the personal property removal phase of each mission.
- Provide an armed police officer for each phase for protection from wildlife.
- Provide storage for all personal property until property disposal board determines a final disposition.
- Coordinate with the U.S. Marshal Service for a marshal to be on site for all "B" or "C" structures recons and property removal efforts. The Post Commander has the authority to waive this requirement.

- Assist in transporting recovered property from the field to storage.

Staff Judge Advocate:
- Review all releases and statements to the public.
- Assist in processing all personal property claims.
- Provide assistance in any legal action that may be required for recalcitrants.

Directorate of Logistics:
- Assist with transportation and storage of recovered property if necessary.

Directorate of Plans, Training, Security and Mobilization:
- Advocate for this mission and assist in all required coordination.
- Act as the Emergency Operations Center.
- Provide needed personnel.
- Provide skills and safety training for power tool operators.
- Brief post staff and commander prior to abatement operations.

408th Signal:
- Provide communication equipment.

4-123 AVN:
- Provide monthly overflights of the training areas to ensure no new structures are being built and existing structures are identified.
- Provide aircraft during both the property removal and abatement phases if necessary.

The Trespass Structure Abatement Program must wait a minimum of 45 days from the day the property is removed from a structure before destroying the structure, to allow compliance with appropriate Army property regulations.

## SC5.2 Trespass Structure Removal

The primary technique for structure disposal is controlled burn. Prior to conducting a structure burn, coordination with Fort Wainwright's Fire Department will be completed. In addition the Alaska Fire Service must be informed of the control burn. Prior to burning any structure, any materials that will cause an environmental or safety concern, when burned, must first be removed and disposed of according to standard practices. If a controlled burn is determined to be too risky based on fire conditions or other environmental concerns, the structure will be broken down into non-reusable sizes. Wood and natural materials will be left on-site to decompose. All other materials will be removed from the field.

Since the Trespass Structure Abatement Program has been initiated, nearly all the trespass structures known to the Army have been abated to some degree. Additional work will be done to clean existing sites of materials that will not decompose. Challenges to the Trespass Structure Abatement Program remain with continued structure encroachment and litter. New sites, generally in the "A" and "B" categories, continue to come to the Army's attention and will be addressed within the current policy.

Public support and compliance with Army outdoor recreation policies, including trespass structures, will be enhanced through a vitalized conservation awareness program stressing land stewardship. A conservation awareness program must be directed to both military and community users of training lands to be effective.

# SD INSTITUTIONAL CONTROLS

## SD1 Introduction

Institutional controls are controls the installation places on behaviors of its users. These controls often are to protect the users for safety reasons. In Comprehensive Environmental Response, Compensation and Liability Act, institutional controls are placed to prevent intentional or unintentional users from disturbing contaminated areas. More broadly defined, institutional controls also can refer to any controls placed on users. These controls are the result of laws, regulations, and policies. The following section details the requirements and controls resulting from these laws, regulations, and policies.

## SD2 Laws

Both federal and state laws affect natural resource management. The primary federal laws include the National Environmental Policy Act, Clean Water Act, Coastal Zone Management, Migratory Bird Treaty Act, and National Historic Preservation Act.

### SD2.1 National Environmental Policy Act

National Environmental Policy Act (NEPA) documentation must be completed on all USAG-AK natural resource management projects. NEPA requires federal agencies to consider environmental consequences of major proposed actions. NEPA documentation for this Integrated Natural Resources Management Plan is in the form of an environmental assessment, which analyzes the potential consequences of the proposed action to implement the Integrated Natural Resources Management Plan.

NEPA requires federal agencies to consider the environmental consequences of proposed major federal actions. The premise of NEPA is to provide environmental information to public officials and citizens before decisions are made and actions are taken. The process is intended to help public officials and citizens make decisions that are based on timely and scientifically accurate information. The analysis must fully disclose the environmental effects of the action and demonstrate that the project proponent and the decision-maker have taken an interdisciplinary "hard look" at the environmental consequences of implementing the major federal action. Ultimately, federal agencies must consider all practicable means to restore and enhance the quality of the human environment and avoid or minimize any possible adverse effects of their actions upon the quality of the human environment.

The Council on Environmental Quality was established under NEPA to implement and oversee federal policy in this decision-making process. The Council on Environmental Quality uses the *Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act* (40 CFR 1500-1508) for this function. Council on Environmental Quality regulations (40 CFR 1508.9) specify that an environmental assessment be prepared to:

- Briefly provide evidence and analysis for determining whether to prepare an environmental impact statement or a Finding of No Significant Impact.
- Aid in an agency's compliance with NEPA when no environmental impact statement is necessary.
- Facilitate preparation of an environmental impact statement when one is necessary.

In addition, according to Council on Environmental Quality regulations (40 CFR 1500.2(c)), NEPA's requirements should be integrated "with other planning and environmental review procedures required by law or by agency practice so that all such procedures run concurrently rather than consecutively."

AR 200-2, *Environmental Analysis of Army Actions*, dictates policies, responsibilities, and procedures for integrating environmental considerations into Army planning and decision-making. It implements the Council on Environmental Quality's NEPA regulations and directs installations to integrate environmental analysis as much as practicable with other environmental reviews, laws, directives, and executive orders. This regulation requires that natural resources management plans be evaluated for environmental impacts (32 CFR Part 651 Section 651.10 (b) of AR 200-2). The requirements of AR 200-2 will be addressed through the preparation of an environmental assessment on the potential effects of implementing an Integrated Natural Resources Management Plan on USAG-AK lands.

AR 200-3, *Natural Resources-Land, Forest and Wildlife Management*, outlines policy, procedures, and responsibilities for the conservation, management, and restoration of land and the natural resources thereon consistent with the military mission and other applicable national policies. AR 200-3 states that "Integrated Natural Resources Management Plans require appropriate environmental review according to the National Environmental Policy Act and AR 200-2…appropriate level of documentation will be determined on an installation by installation basis." AR 200-3 further states, "It is Army policy to integrate environmental reviews concurrently with other Army planning and decision-making actions to avoid delays in mission accomplishments."

AR 200-2 (32 CFR Part 651 Section 651.14 (a)) states that "The Army goal is to concurrently integrate environmental reviews with other Army planning and decision-making actions, thereby avoiding delays in mission accomplishment. To achieve this goal, proponents shall complete NEPA analysis as part of any recommendation or report to decision-makers prior to the decision (subject to 40 CFR 1506.10. Early planning (inclusions in Installation Master Plans, Integrated Natural Resources Management Plans, Integrated Cultural Resources Management Plans, Acquisition Strategies, strategic plans, etc.) will allow efficient program or project execution later in the process."

As proposed projects within this Integrated Natural Resources Management Plan are implemented, appropriate required NEPA documentation will be prepared. Projects will be evaluated to determine the need for and appropriate level of NEPA documentation, such as a Record of Environmental Consideration, environmental assessment with a Finding of No Significant Impact, or an environmental impact statement with a Record of Decision.

## SD2.2 Clean Water Act

The U.S. Army Corps of Engineers has been regulating activities in the nation's waters since 1890. Until the 1960s, the primary purpose of the regulatory program was to protect navigation. Since then, as a result of laws and court decisions, the program has been broadened so that it now considers the full public interest for both the protection and utilization of water resources.

The regulatory authorities and responsibilities of the Corps of Engineers are based on the following laws:

Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403) prohibits the obstruction or alteration of navigable waters of the United States without a permit from the Corps of Engineers.

Section 404 of the Clean Water Act (33 U.S.C. 1344). Section 301 of this Act prohibits the discharge of dredged or fill material into waters of the United States without a permit from the Corps of Engineers.

Section 103 of the Marine Protection, Research, and Sanctuaries Act of 1972, as amended (33 U.S.C. 1413) authorizes the Corps of Engineers to issue permits for the transportation of dredged material for the purpose of dumping it into ocean waters.

Other laws may also affect the processing of applications for Corps of Engineers permits. Among these are the National Environmental Policy Act, the Coastal Zone Management Act, the Fish and Wildlife Coordination Act, the Endangered Species Act, the National Historic Preservation Act, the Deep-water Port Act, the Federal Power Act, the Marine Mammal Protection Act, the Wild and Scenic Rivers Act, and the National Fishing Enhancement Act of 1984.

### SD2.2.1 Section 404 Permit Application Form 4345

The application form used to apply for a permit is Engineer Form 4345, Application for a Department of the Army Permit. Applications can be obtained from one of the Corps of Engineers district regulatory offices or in Appendix C5 of the USAG-AK Integrated Training Area Management (ITAM) Management Plan. It is important to provide complete information in the requested format or processing of the application will be delayed. This information will be used to determine the appropriate form of authorization, and to evaluate your proposal. Some categories of activities have been previously authorized by nationwide or regional permits, and no further Corps approvals are required. Others projects may qualify for an abbreviated permit processing in which a permit decision can usually be reached in less than 30 days. Authorizations will usually be in the form of letters of permission. For other activities, a public notice may be required to notify federal, state, and local agencies, adjacent property owners, and the general public of the proposal to allow an opportunity for review and comment or to request a public hearing. Most applications involving public notices are completed within four months and many are completed within 60 days. The district engineer will begin to process your application immediately upon receipt of all required information. You will be sent an acknowledgement of its receipt and the application number assigned to your file. You should refer to this number when inquiring about your application. Your proposal will be reviewed, balancing the need and expected benefits against the probable impacts of the work, taking into consideration all comments received and any other relevant factors. This process is called the public interest review. The Corps' goal is to reach a decision regarding permit issuance or denial within 60 days for receipt of a complete application. However, some complex activities, issues, or requirements of law may prevent the district engineer from meeting this goal.

Applicants should provide specific plan view and elevational view project drawings at the time the Permit Form 4345 is submitted to Corps Regulatory for review. This form is located in Appendix C5 of the USAG-AK ITAM Management Plan. Applicants can also utilize the Army Corps of Engineers Guide to Permit Drawings which is located in Appendix C4 of the same plan. Applicants need to ensure that all the information on Form 4345 is filled out correctly and completely while paying particular attention to developing correct fill calculations for each project.

### SD2.2.2 Storm Water Permit Application

Contractors hired to do construction projects on Army land need to comply with storm water permit requirements. Any project that disturbs one or more acres of land through clearing, grading, excavating, or stockpiling of fill material. If there is any possibility that storm water could run off of your project site, then permit cover is necessary. Failure to obtain permit coverage could result in fines up to $32,500 per day. Conservation and Integrated Training Area Management projects are managed through the Palmer and Salcha Delta Soil and Water Conservation Districts. It is the responsibility of the districts to ensure that all contractors hired to do work on USAG-AK lands obtain proper permit coverage.

**There are six steps involved with obtaining permit coverage:**

**Step 1:** Read the Environmental Protection Agency's Construction General Permit. Read this document carefully and remember that operators are legally responsible for complying with all its provisions. The “operator” submits a Notice of Intent form. The operator is the entity (generally company, corporation, etc.) that has operational control over the construction plans or day-to-day activities that are necessary to implement the Storm Water Pollution Prevention Plan (Solid Waste Pollution Prevention Plan). On some sites, several entities may meet the definition of operator and all must file Notice of Intents. Operators may include owners, general contractors, and subcontractors.

It is the responsibility of the operator(s) to develop and implement a Solid Waste Pollution Prevention Plan and maintain all best management practices during each stage of the project. Best management practices are the techniques (buffers, silt fences, detention ponds, swales, etc.), schedules of activities, prohibitions of practices, and maintenance procedures to prevent or reduce the discharge of pollutants.

**Step 2:** Develop a storm water pollution prevention plan. The Solid Waste Pollution Prevention Plan is a plan for how you will control storm water runoff from your construction site. It is broader and more complicated than a typical erosion and sediment control plan, so operators might want to enlist the assistance of a professional to save time. The Solid Waste Pollution Prevention Plan must be completed before you file an Notice of Intent to apply for coverage under Environmental Protection Agency’s permit. You don’t have to submit the Solid Waste Pollution Prevention Plan with your Notice of Intent to obtain permit coverage, but the plan must be available on-site for review during inspection.

Because every site is unique, every Solid Waste Pollution Prevention Plan is unique. The Solid Waste Pollution Prevention Plan needs to be updated as your work progresses.

The basic Solid Waste Pollution Prevention Plan principles are as follows:

- Divert storm water away from disturbed or exposed areas of the construction site. Install best management practices to control erosion and sediment and manage storm water.
- Inspect the site regularly and properly maintain best management practices, especially after rainstorms.
- Revise the Solid Waste Pollution Prevention Plan as site conditions change during construction and improve the Solid Waste Pollution Prevention Plan if best management practices are not effectively controlling erosion and sediment.
- Minimize exposure of bare soils to precipitation to the extent practicable.
- Keep the construction site clean by putting trash in trash cans, keeping storage bins covered, and sweeping up excess sediment on roads and other impervious surfaces.

**Step 3:** Complete an endangered species determination for the project site. The operator must assess the potential effects of storm water runoff on federally listed endangered and threatened species and any designated critical habitat on or near the site. In making this determination, the operator needs to consider areas beyond the immediate footprint of the construction activity and beyond the property line–essentially, areas that could be affected directly or indirectly by storm water discharges.

**Step 4:** File a Notice of Intent. The Novice of Intent form lets the Environmental Protection Agency know that you are filing for permit coverage. It is also your certification that you have read, understood, and are implemented the requirements of the Environmental Protection

Agency's permit. The fastest and easiest way to obtain permit coverage is through the Environmental Protection Agency's new online permit application system (WWW.Epa.gov/npdes/enoi). The Environmental Protection Agency's permit requires a 7-day waiting period after a Notice of Intent is filed and posted on the Environmental Protection Agency's web site (www.epa.gov/npdes/noisearch). Using the Environmental Protection Agency's eNotice of Intent system is the fastest way to begin this process. Mailing a paper Notice of Intent to the Environmental Protection Agency can add two or more weeks to your processing time. During the waiting period, Notices of Intent are reviewed for endangered species impacts and other concerns. Permit coverage begins at the conclusion of the 7-day period unless you are notified otherwise. Your completed Notice of Intent should be posted at the construction site in a place accessible to the public.

**Step 5:** Implement all best management practices outlined in your Solid Waste Pollution Prevention Plan. Remember to follow your Solid Waste Pollution Prevention Plan. All best management practices must be inspected and maintained regularly. Inspections are required either (1) at least once every 7 days or (2) at least once every 14 days and within 24 hours of the end of a rain event of ½ inch or more. The plan must also be updated as site conditions and best management practices change. Remember to keep records of your maintenance activities and any Solid Waste Pollution Prevention Plan modifications for review during inspection.

**Step 6:** File an electronic Notice of Termination. You should terminate permit coverage when your project is completed (generally, when 70% of the density of the original vegetation is reestablished on unpaved areas), when the property has been stabilized and ownership has been transferred to the homeowner (residential projects only), or when another operator has assumed control over the site (new operators will need to file an Notice of Intent and meet the requirements of Environmental Protection Agency's permit). The electronic Notice of termination form informs Environmental Protection Agency that your construction project is complete and ends your responsibilities under the permit. The form can be completed and filed using the eNotice of Intent system at www.epa.gov/npdes/enoi.

## SD2.3 Coastal Zone

### SD2.3.1 Coastal Project Questionnaire and Certification Statement Form

The Alaska Coastal Management Plan requires that projects in Alaska's coastal zone be reviewed by coastal resource management professionals and found consistent with the statewide standards of the Alaska Coastal Management Plan. These standards and the enforceable policies of an affected coastal district ensure that development interests observe the vision set out for the future by the state and coastal communities. It is called the consistency review process. A finding of consistency with the Alaska Coastal Management Plan must be obtained before permits can be issued for the project.

The coastal consistency review process, or consistency review process, helps ensure your project meets the statewide standards and coastal district policies. It also serves as the review process for most permits you will need from state resource agencies. This 5-step process advances your project through review and approval requirements in a timely fashion. The consistency review process is a coordinated review process that benefits applicants and project reviewers alike. Applicants have a single, primary point of contact for their projects. Reviewers benefit by comprehensively reviewing a project only once. The Office of Project Management and Permitting, as well as state resource agencies and coastal districts, are available to help you understand and navigate your project through the consistency review process.

The Alaska Coastal Management Plan applies to projects within or affecting Alaska's coastal zone. The statewide standards (6 AAC 80) and coastal district enforceable policies of the Alaska Coastal Management Plan provide direction for coastal resources and uses, such as:

- coastal development (whether a project is water-dependent or water-related)
- habitats (such as wetlands, tideflats, or streams)
- air, land, and water quality
- transportation and utility routes and facilities
- timber harvest
- mining and mineral processing
- subsistence opportunities
- recreation designations
- geophysical hazard areas
- historical and archaeological resources
- energy facilities
- fish and seafood processing

Using the statewide standards and local enforceable policies, the Alaska Coastal Management Plan evaluates the effects a project will have on the above coastal resources and uses. Projects must be consistent with the requirements found in the standards and enforceable policies.

The Office of Project Management and Permitting is home to the Alaska Coastal Management Plan. Located in the Department of Natural Resources, the Office of Project Management and Permitting is responsible for the overall administration and operation of the Alaska Coastal Management Plan. In this role, the Office of Project Management and Permitting provides assistance to applicants, coastal districts, and state agencies in carrying out their duties and responsibilities under the Alaska Coastal Management Plan. The Office of Project Management and Permitting has connections throughout the Alaska Coastal Management Plan network.

As such, your first Alaska Coastal Management Plan contact should probably be one of Office of Project Management and Permitting 's Project Review Coordinators. The Office of Project Management and Permitting also serves as the coordinator for the consistency review process if your project requires a federal permit or permits from more than one state agency. The staff at the Office of Project Management and Permitting perform a variety of other activities that support the Alaska Coastal Management Plan, including

- pre-application meetings for applicants
- federal funding for the Alaska Coastal Management Plan
- assistance to local districts in getting their coastal management programs approved
- assistance resolving conflicts
- appeals, elevations, and petitions
- Alaska Coastal Management Plan education and training

The state of Alaska has three agencies primarily responsible for managing its natural resources and uses of those resources. These resource agencies have permitting authorities for specific activities. If your project requires a permit(s) from only one state resource agency, that agency coordinates the consistency review process. Your project will most likely require one or more permits from at least one resource agency. The state resource agencies include:

- The Department of Natural Resources (Division of Mining, Land and Water; State Historic Preservation Office; and Office of Habitat Management and Permitting) manages state-owned land and natural resources, including sales and leases. There is a possibility a project could require a permit from all three of these Department of Natural Resources offices.

- The Department of Fish and Game manages the state's fish and wildlife resources and their habitats and permits activities on state refuges.
- The Department of Environmental Conservation serves to safeguard the public health and environment from human uses.

During the consistency review process, an affected coastal district reviews your project against the enforceable policies of its coastal management program. By complying with its enforceable policies, your project can help the district achieve its goals and objectives for coastal development within its boundaries.

If your project meets the following two criteria, or if you are unsure, you should contact the Office of Project Management and Permitting. One of the Office of Project Management and Permitting 's Project Review Coordinators will help you determine if your project requires an Alaska Coastal Management Plan consistency review and guide you to the state agencies and coastal districts you may need to contact.

Your project may require an Alaska Coastal Management Plan consistency review if it is:

1) located in or will affect resources of the coastal zone and

2) requires state, federal, or local permit(s). (If you are unsure about the location of your project in relation to Alaska's coastal zone or the permits required for your project, keep reading.)

Alaska's coastal zone boundaries include more than 44,000 miles of coastline and can extend inland along river drainages as far as 250 miles. This variability can make it difficult to tell if your project is within the coastal zone.

The coastal zone map shows a representation of Alaska's coastal zone and coastal districts. If your project is located within a coastal district, you should contact either the Office of Project Management and Permitting at 269-7470 (Anchorage), or the coastal district to determine whether your project is within its coastal zone. Coastal district contact information is located on Alaska Coastal Management Plan district web page.

If you are not sure what permits your project might require, fill out a Coastal Project Questionnaire for your own information. Even if you don't require an Alaska Coastal Management Plan consistency review, the questions in the Coastal Management Questionnaire will help you identify what permits might apply to your project and who to contact for more information. If you discover your project does require an Alaska Coastal Management Plan consistency review, you will have saved valuable time. The Coastal Project Questionnaire can be found in Appendix C7 of the USAG-AK ITAM Management Plan.

## SD2.4 Migratory Bird Treaty Act

### SD2.4.1 Timber Clearing Guidance

Tree clearing is conducted by hand and machine. Trees are removed within a specific area and cut to length and piled for personal firewood harvest, piled and burned, chipped and spread out, or buried on site.

Trees are typically cut, ground or sheared to ground level with minimal to moderate intrusion into mineral soil. Some tree thinning operations require the use of a dozer, which can result in the removal of the root balls and associated soil. Most mechanical clearing operations are conducted on frozen soil conditions. When clearing or cutting near water bodies it is necessary to maintain a riparian buffer zone if possible.

I. Mechanical Thinning

Mechanical thinning is conducted with a feller buncher (cut), an excavator (CAT 320) with a thumb attachment (pull) or a hydro-axe (grind). Specific areas of trees are removed by cutting, grinding or pulling. Mechanical clearing typically involves large areas and wide spacing. Mechanical thinning operations are conducted in hazardous fuel reduction, maneuver corridor and training facility line-of-sight projects.

II. Mechanical Clearing

Mechanical clearing is conducted with a feller buncher (cut), a dozer fitted with a straight or shear blade (shear) or a hydro-axe (grind). Specific areas of trees are removed by cutting, grinding or shearing. Mechanical clearing typically involves large areas and wide spacings. Mechanical thinning operations are conducted in hazardous fuel reduction, maneuver corridor and training facility line-of-sight projects.

A. Shear Blade

Shear blades (Rome KG) are fitted to the front of large dozers (CAT D8 or larger) and consist of a curved face with a flat cutting edge that rides on the ground surface. Shearblades are used to cut off trees and vegetation at the ground surface in a spiral pattern during frozen soil conditions. Sheared material is rolled into windrows. Shearblades allow for effective stem and trunk cutting with minimal root ball and soil disturbance. Shearbladed material can be left to decompose or piled and burned.

Shearblading is performed during hazardous fuel reduction, fire break and wildlife food plot projects.

B.. Straight Blade

Straight blades are fitted to the front of small to large sized dozers (CAT D4-D9) and are used to shear trees and surface organics into piles during clearing operations. Straight blades are used on frozen soil conditions when soil intrusion is an issue. Straight blades are also used for material piling during burning operations.

C. Hydro-axe (Masticating)

A masticating head hydro-axe (Fecon) is used to grind whole trees and woody vegetation into small chip-like residue. Masticating heads are rotating cylinders with offset rows of teeth and can be used to grind to ground surface or deeper. Sub-surface grinding incorporates wood material into the soil. Masticating hydro-axe work is performed during frozen and non-frozen soil conditions, depending on soil type and ground moisture. Masticating hydro-axes are used in hazardous fuel reduction, fire break, line-of-sight and roadside clearing projects.

D. Hydro-axe (Flail)

A flail head hydro-axe is an attachment on an excavator (CAT 320) body and is used to grind whole trees and woody vegetation into large chip residue. Flail heads are rotating blades attached to an articulating arm and are used to grind to ground surface level. Flail head hydro-axe work is performed during frozen and non-frozen soil conditions, depending on soil type and ground moisture. Flail head hydro-axes are used in hazardous fuel reduction, fire break, line-of-sight and roadside clearing projects.

**III. Mowing**

Mowing is performed on areas with woody vegetation less than 2” in diameter. Areas are mowed with a tractor (John Deere 4020)-pulled brush mower. Mowing allows for residue to remain on-site and perform as a mulch layer. Mowing is performed on roadside clearing, drop zone management and wildlife food plot projects. Mowing is typically conducted on a 3-5 year rotation cycle.

**IV. Vegetation Cutting and Thinning (Hand)**

Hand thinning is individual tree specific and results in limited residual tree damage. Trees are thinned to a determined stem per acre specification. Hand crews use chain saws and axes to remove trees. Hand thinning operations are conducted in hazardous fuel reduction and maneuver corridor projects. Hand thinning is utilized in areas with unfrozen hydric soils.

Hand clearing is small area specific and results in limited residual tree damage around clearing perimeters. Hand crews use chain saws and axes to remove trees. Hand clearing operations are conducted around vertical training facilities and areas to small to maneuver equipment. Hand clearing is utilized in areas with unfrozen hydric soils.

## SD2.5 National Historic Preservation Act

In the past, natural resources management projects were overlooked as potential causes of adverse impacts to archeological sites. Activities such as tree removal and training land restoration are all potentially damaging. In order to reduce negative impacts to cultural resources, projects that involve ground-disturbing activities will be processed through the USAG-AK Cultural Resources Manager. Furthermore, the Cultural Resources Manager will be consulted in areas of long-range planning (such as the Integrated Natural Resources Management Plan) that define policy.

Determination of effect and consultation guidelines provided in implementing regulations for the National Historic Preservation Act (36 CFR 800) will be followed during review of projects. Any project assessed as having an effect on a cultural resources site or historic property will be coordinated with the Alaska State Historic Preservation Office. Section 106 of the National Historic Preservation Act has been considered in the preparation of this plan, and it has been determined that there are no significant issues associated with the implementation of this plan.

Natural resources-related law enforcement actions also have the potential to beneficially impact preservation of cultural resources. If natural resources enforcement officers are added to the USAG-AK Conservation staff, they will also be trained in the enforcement of various cultural resources laws, especially the Archeological Resources Protection Act.

Natural and cultural resources are not mutually exclusive. Personnel involved in both of these programs will work closely with one another to ensure their successful integration.

## SD2.6 Comprehensive Environmental Response, Compensation & Liability Act

### SD2.6.1 Fort Richardson, Fort Wainwright, Donnelly Training Area Dig Permit Forms

Conservation and Land Rehabilitation and Maintenance project coordination should be made with Directorate of Public Works Construction Management Branch at least two weeks prior to project execution. The utility locate process and procedures are strictly enforced by the Directorate of Public Works Construction Management Branch, the Directorate of Public Works Utility Shops, and the Fort Richardson Post Safety Office. Specific instructions for obtaining dig permits for Fort Richardson, Fort Wainwright and Donnelly Training Area are located in Appendix C8 of the USAG-AK ITAM Management Plan.

Both the contractor and the Directorate of Public Works Utility Shops must use the American Public Works Association Color codes. Prior to requesting utilities locate, it is the contractor's responsibility to field mark the limits of the proposed excavation using white paint. The Directorate of Public Works Utility Shops will field mark (locate) utilities within the limits of excavation indicated in white by the contractor on the ground in the field. It is the responsibility of the Land Rehabilitation and Maintenance project manager to ensure, at a minimum, that project submission should include a written description of the project area and the type of construction or rehabilitation techniques that will be utilized. In addition to the description, a vicinity and plan view map will be included. Some projects may require a more detailed elevation and/or cross section view map depicting the project area. The maps should be labeled accordingly and easy to understand. Specific guidance for creating Conservation and Land Rehabilitation and Maintenance project maps is located under Wetlands Permitting chapters 5.5.3.3, 5.5.3.4 and 5.5.3.5 of the USAG-AK ITAM Management Plan.

## SD2.7 State Regulatory Requirements

Alaska Statute 41.14.840 (Fishway Act) requires that an individual or governmental agency notify and obtain authorization from the Alaska Department of Natural Resources for activities within or across a stream used by fish if the department determines that such uses or activities could represent an impediment to the efficient passage of fish. Culvert installation; stream realignment or diversions; dams; low-water crossings; and construction, placement, deposition, or removal of any material or structure below ordinary high water all require approval from the Department of Natural Resources.

Alaska Statute 41.14.870 (Anadromous Fish Act) requires that an individual or governmental agency provide prior notification and obtain approval from the Department of Natural Resources "to construct a hydraulic project or use, divert, obstruct, pollute, or change the natural flow or bed" of a specified anadromous water body or "to use wheeled, tracked, or excavating equipment or log-dragging equipment in the bed" of a specified anadromous water body. All activities within or across a specified anadromous water body and all in stream activities affecting a specified anadromous water body require approval from the Department of Natural Resources, including construction; road crossings; gravel removal; placer mining; water withdrawals; the use of vehicles or equipment in the waterway; stream realignment or diversion; bank stabilization; blasting; and the placement, excavation, deposition, disposal, or removal of any material. Recreational boating and fishing activities generally do not require a permit.

The description and location of specified anadromous water bodies is contained in the "Catalog of Waters Important for the Spawning, Rearing, or Migration of Anadromous Fishes." Copies of the catalog may be viewed at any Office of Habitat Management and Permitting.

### SD2.7.1 Fish Habitat Permit Application

Some USAG-AK Conservation and Integrated Training Area Management projects that exist along or near water bodies may require a state fish habitat permit. There are seven steps to obtaining permit coverage.

**Step 1:** Provide your name, address, and telephone number and the name, address, and telephone number of the contractor who will be doing the work, if known.

**Step 2:** **A** Name of the water body in or adjacent to which the project will occur.

**B.** For Anadromous stream numbers, refer to the Atlas to the Catalog of Waters Important for Spawning, Rearing or Migration of Anadromous Fishes.

**C. Plan Specifications**

**1.** Provide plans (or field sketch) showing the following as a minimum: access to the plan view showing all project features and dimensions, or crossing/fording sites; material removal plans should also include, at a minimum, the following: 50’ contour lines; nearby watercourses and lakes; location of facilities (i.e., screening, washing, and crushing plants, and commercial and private buildings); aliquot parts identified in order they are to be mined; site where fuel will be stored; a cross section view of the material site showing current land and water elevations and bank slopes and final excavation grades and slopes; and project expansion sites (scale no greater than 1 in. = 400 ft.)

**2.** Provide specifications, if available.

**3.** Provide a current aerial photograph, if available.

**Step 3**: Describe the type of project (e.g., bridge, culvert, utility line placement, impoundment structure bank stabilization, channelization, low water crossing, log removal, etc.) and the purpose of the project. A brief description of alternatives considered would be useful but is not required.

**Step 4**: Indicate the time of year when project construction will occur. Is the project temporary or permanent?

**Step 5**: What precautions will be taken to insure that fish and other aquatic organisms are protected from adverse impacts? Outline plan for restoring, rehabilitating, or revegetating the site if channel or bank alterations occur. What precautions will be taken to maintain state water quality standards.

**Step 6**: Provide the water body characteristics at the site of the project.

**Step 7**: Provide available hydraulic information for the types of projects indicated. For information on selecting a culvert size that will ensure fish passage, consult Office of Habitat Management and Permitting permitters or references available at the Office of Habitat Management and Permitting offices.

## SD3. Regulations

USAG-AK and USAG-AK regulations also affect natural resources management. The two regulations that primarily affect natural resources management are U.S. Army Alaska Regulation 350-2, *Range Regulation* and USAG-AK Regulation 200-3, *Conservation Management*.

### SD3.1 U.S. Army Alaska Range Regulation 350-2

U.S. Army Alaska Range Regulation 350-2 includes all the controls on military users on USAG-AK lands.

### SD3.1.1 Environmental Protection

Restrictions on training are sometimes necessary for ecosystem protection. USAG-AK has incorporated environmental restrictions into U.S. Army Alaska Regulation 350-2, *Range Regulation*, last modified in 1995. The following section outlines the protection of environmental resources during training and is shown below.

#### *SD3.1.1.1 General*

The intent of this section is to enhance training by conserving the training environment and terrain. It is extremely important to use the training resources to your advantage while conserving them for future use. Preventing maneuver damage and maintaining the training quality is a command responsibility. Training will be conducted in a manner that ensures optimum use of the land while adhering to environmental and natural resource regulations, policies and planning decisions. The Army has an obligation to act responsibly and effectively in the use of land and other natural resources required in fulfilling its mission. The obligations include, but are not limited to:

- Watershed protection to minimize soil-disturbing activities by construction equipment and other vehicles, which can result in vegetation destruction, rutting and erosion.
- Protection of forest lands from indiscriminate tree cutting.
- Prevention and control of unwanted wildfires.
- Optimum use and management of wildlife resources.
- Cooperation in pollution abatement and waste control.
- Protection of historic and archaeological sites.
- Allowing controlled public access for recreational uses.

#### *SD3.1.1.2 Policy*

Army environmental practice is based on the National Environmental Policy Act, which commits agencies of the federal government to consider the effects of proposed actions during the decision process and to document this consideration. All Army actions must include consideration of impacts to the environment. This consideration may consist of a record of environmental consideration, an environmental assessment, or it may develop into a major project such as an environmental impact statement. Commanders must ensure that appropriate environmental documentation has been completed for all training activities. Guidance for Army implementation of National Environmental Policy Act is contained in AR 200-2, *Environmental Analysis of Army Actions*. Other laws and regulations which affect training use of military lands include the Clean Water Act, the Endangered Species Act, the Sikes Act, the National Historic Preservation Act, AR 200-1, *Environmental Protection and Enhancement*, and AR 200-3, Natural Resources - *Land, Forest and Wildlife Management*.

Integrated Natural Resource Management Plans and Integrated Training Area Management programs are being developed for each Alaskan post. They promote a realistic training environment while ensuring land stewardship and environmental compliance. Computer-generated maps depicting natural and man-made information from the posts' databases are being developed. This information will be used to evaluate land capability for sustained training and multiple use management of resources. Land conservation will be integrated into training plans by avoiding unnecessary environmental damage. Unit commanders planning to conduct training on Alaskan Army posts will be required to use these resources to minimize environmental impacts and to maximize sustainability of training land resources.

#### *SD3.1.1.3 Environmental Considerations*

**Noise**

Firing demolition, artillery, or mortars from 2200 to 0600 is prohibited, and demolition charge sizes are limited. In addition, any training activity that generates noise (firing of blanks, pyrotechnics, simulators, etc) between 2200 and 0600 in areas adjacent to populated areas is also prohibited. Exceptions to firing hours require public notification of late firing. An exception to firing hours can be obtained by submitting a late fire request to Range Control. Range Control will submit notification to the Public Affairs Office so that a notice of firing can be published. Late fire requests must be submitted 12 working days before the desired training event.

**Digging**

Foxholes, trench systems, tank traps, hull down positions, explosive excavations, etc. must be refilled and leveled before redeployment. Where excavation is required, the organic layer will be removed first and stockpiled so it can be spread over disturbed sites after back-filling is complete. All overhead cover, such as logs, must be disassembled and scattered. Wire, rope and string will be removed and disposed of properly.

**Waste Disposal**

- Police all training areas before, during, and after use. Even if it is not your litter, pick it up because it can give away your position. All cartridges, tubes, containers, packing material and all other material introduced into the environment in conjunction with maneuver activities will be removed to the maximum practical extent. Remove all barbed, commo, concertina, and trip wire and properly dispose of it according to post procedures.
- Under no circumstances will units bury or burn waste.
- Use permanent latrines for human waste, when available. Where permanent latrines are not available, unit commanders must provide ample portable latrines. Unit Commanders are personally responsible to prevent the contamination of water resources.
- All vehicles are required to have a supply of plastic garbage bags for trash collection.

**Fires**

- Immediately report all fires to Range Operations or the Fire Department. Know the grid location, nature and size. Units are to stop training and assist the fire fighters except when the fire is in an impact area.
- The use of pyrotechnics, smoke pots, and grenades may be restricted when fire danger is high. Smoke grenades and star cluster flares will be only used for emergency operations in high fire danger times.
- Burn pans are required to burn excess powder charges.
- Open fires are prohibited except in emergencies or as part of approved training exercises. Units desiring to build fires should submit a request to burn to range control which includes materials to be burned, quantity, length of burning, etc. The request should be submitted well in advance of the planned burning.

**Vehicle Movement**

- Vehicles should remain on marked trails and designated routes except when directed otherwise during tactical deployment. Drive on established roads during administrative time. Cross-country vehicular travel (such as small unit support vehicles) is not restricted during winter months. During breakup (usually 1 April through 15 May) all vehicles are restricted to established roads and dry trails. During summer months (usually May through September) cross-country movement is permitted in all areas except designated creek bottoms, marshes, and moist and alpine tundra areas. A list of areas designated as closed during summer months are maintained by Range Control.

- In training areas, heavy artillery and armored tracked vehicles must keep at least 10 meters from the base of trees and all other vehicles, 5 meters away. This is to avoid erosion and soil compaction, which would eventually kill the trees.
- Movement into off-limit areas is strictly prohibited. Personnel found in violation are subject to disciplinary action.
- Vehicles are prohibited from driving across, into, or within streams, ponds, lakes and wetlands. Vehicular stream crossing is allowed in winter months (usually October through March) at permitted ice bridge sites and other areas, as approved by the Directorate of Public Works, Environmental Resources Department. The stipulations listed on ice bridge permits issued by the State of Alaska are made as part of this document. Stream crossing during the rest of the year is subject to approval by the Environmental Resources Department. Approval depends upon adherence to stipulations outlined by the Environmental Resources Department and, where applicable, when permits are received from the State of Alaska.

**Off-Limit Areas**

All areas within ½ mile of the military reservation boundaries are closed to training activities as a buffer to adjacent nonmilitary land uses. The ½ mile-restriction does not apply to the close-in training areas. Exceptions include all access routes and those areas specifically approved by Range Control. Improved recreational areas are closed to training unless otherwise approved by Environmental Resources Department.

**Camouflage**

- Live vegetation greater than 4 inches will not be cut or damaged during training without written approval from Range Operations. If trees larger than 4 inches in diameter are required, contact the Environmental Resources Department for an approved area. Destruction of trees and brush must be avoided unless it is required to achieve training objectives.
- Trees under 4 inches in diameter may be cut without coordination with Environmental Resources Department, if necessary, to achieve training objectives. Spruce boughs (limbs) may not be cut from live, standing trees; boughs may be obtained by cutting spruce trees under 4 inches in diameter. All trees will be cut less than 6 inches from the ground.
- Use camouflage nets instead of live vegetation. The nets are designed to break up the visual lines of equipment and structures. Once live vegetation is cut, it wilts quickly, and does not conceal your position.
- Communications wire, power lines and auxiliary cables should be strung along the edge of open areas or trails and run along the ground when feasible and compatible with training objectives. When it is necessary to suspend wire above the ground, care should be taken not to break trees, branches, stems, etc.; the use of nails and wire loops should be minimized.

**Fish and Wildlife**

Harassment of fish and wildlife is prohibited. Any action which disturbs fish and wildlife is considered harassment by federal and Alaska state law. Harassment includes such things as pursuit with vehicles or aircraft, feeding and shooting of wildlife. Individuals who harass fish and wildlife are subject to prosecution. In addition, impact and training areas may be temporarily closed to artillery fire and aerial bombardment during periods of significant fish and wildlife use. The Alpha Impact Area at Fort Wainwright is closed 15 May through 30 June for moose calving.

**Cultural Resources**

Identified historical and archaeological sites will be left undisturbed. Any historical or archaeological discoveries made as a result of any military activities should also be left undisturbed and must be reported immediately to the Environmental Resources Department.

**Public Access**

Per Public Law 87-327 and AR 200-3, USAG-AK controlled lands are open to civilians and off duty military personnel for outdoor recreation such as hunting, fishing, trapping, berry picking, hiking and nature photography. Units may encounter these people during the conduct of training. If the presence of civilians interferes with training activities, units will contact Range Control to have the civilians removed. Under no circumstances will traplines or trapped animals be disturbed.

**Petroleum, Oil and Lubricants (POL)**

- Petroleum, oils and lubricants distribution points and refueling operations shall be set up and operated per USAG-AK Regulation 200-1. Drip pans must be utilized at all dispensing points. Units shall have available a spill kit consisting of at least a shovel, absorbent material (dry sweep), plastic bags, and drip pans. Improper handling of POL products constitutes gross negligence, punishable by fine or imprisonment.
- Immediately report POL spills to the Fire Department or Range Operations. Know size, location, and type of POL spill. Take immediate action to control, contain, and clean up the spill per the Installation Spill Contingency Plan. Failure to immediately report spills may result in prosecution.
- All hazardous wastes and materials will be handled per the USAG-AK Hazardous Waste and Materials Management Plan for each post. All disposal actions will be coordinated with the Directorate of Public Works, Environmental Department.
- Always turn in unused or waste oil and fog oil (see USAG-AK Regulation 200-4) for recycling along with empty drums and other hazardous wastes, such as old batteries, solvent, and paints.

### *SD3.1.1.4 Damage Control*

Careless use of the training areas will result in terrain damage. If the mission of U.S. Army Alaska is to be fulfilled, realistic training conditions are required. Maneuver damage will decrease the training realism. This will result in substandard training conditions and will undermine the training mission. Maneuver damage needs to be kept to a minimum. The damage that occurs must be repaired. If not, the damage will result in artificial constraints on maneuver training including loss of training acreage, creation of safety hazards, decreased tactical maneuverability, increased maintenance costs, and loss of vegetation, resulting in a loss of quality training terrain, destruction of natural camouflage, and controversy with the general public.

The key to preventing maneuver damage is knowing how to respond properly to different situations. As leaders, the decisions you make will affect the training area by promoting or preventing damage. Once the training land is damaged it is extremely hard and expensive to replace or repair. Training for combat on the modern battlefield often cannot be conducted without damage, but trainers are expected to consider the impact of events, modify plans to avoid damage that violates Army policy, and ensure the repair of unavoidable scenario-driven damage. Training plans will include locations of known sensitive areas and plans for maneuver damage repair. Procedures to reduce maneuver damage include the following:

- Avoid making tactical turns, such as missile avoidance or neutral steer turns, unless absolutely necessary. These types of turns will rip up all the vegetation and it will take the terrain several years to recover.
- Avoid damage to trees.
- Drive on established roads during administrative time. Although it may take longer than moving cross- country, the expense incurred in repairing maneuver damage is very high. Units causing ruts must fill them in as soon as possible.
- Stay away from the edges of roads. Driving on the edges will cause them to break and crumble. This can cause the road to wash out from rain and result in erosion problems.
- Do not drive directly up steep hills.
- Use camouflage nets instead of live vegetation. The nets are designed to break up the visual lines of equipment and structures.
- Do required training with a concern for conservation and future use of range areas.

Units will report maneuver damage to Range Control. Range Control will determine the cause of the maneuver damage. If the damage was caused as a result of unavoidable scenario-driven maneuvers, the units will not be assessed for maneuver damage repair. However, if Range Control determines that the damage was unnecessary and negligent, Environmental Resources Department will conduct a damage assessment and offending units may be charged for maneuver damage repair. Environmental Resources Department will provide technical guidance on cleaning up hazardous materials and rehabilitation of damaged lands.

#### *SD3.1.1.5 Information and Assistance*

The range facility manager and the Environmental Resources Department will assist trainers at any stage of planning with advise on possible impacts of exercise scenarios. Trainers must use this resource early in their planning cycles to provide for protection of known sensitive areas and reduce possible maneuver damage to those areas within the training complex.

Activities which require environmental assistance and coordination include the following:

- Ground-disturbing activities, such as dozer work where soil and vegetation is displaced, disturbance of vegetation in wetlands, construction of new trails and the opening of new borrow areas, etc., will be coordinated with Environmental Resources Department before taking any action.
- Activities which will have impact on waterways or result in discharge of material into waterways will be coordinated with Environmental Resources Department before taking any action.
- Units will coordinate with Environmental Resources Department for the use of trees over 4 inches in diameter for construction or demolition purposes.

### SD3.1.2 Environmental Limitations Overlay

The environmental limitations overlay is based primarily on the rules and constraints of the five-year wetland permit.

The Department of the Army determined there is a continuing military need to conduct military training in all the environments, including wetlands, available on Fort Wainwright, Donnelly Training Area (formerly part of Fort Greely) and Fort Richardson, Alaska. An environmental assessment (Conducting Military Operations in Wetlands at Fort Wainwright and Fort Greely, Alaska) was written in 1999 and included with the permit application. In February of 2000, U.S. Army Alaska received a five-year Section 404 individual wetland permit to conduct military operations that may potentially impact wetlands on

Fort Wainwright and Donnelly Training Area. An application for renewal of that permit will be submitted during summer 2005. Fort Richardson is in a different U.S. Army Corps of Engineers regulatory region, so a separate wetland permit application will be submitted to conduct military operations in wetlands at Fort Richardson.

### *SD3.1.2.1 Purpose and Need*

The purpose of this permit is to diversify military training options at Fort Wainwright, Donnelly Training Area and Fort Richardson to including routine, reoccurring military training activities while ensuring environmental compliance in wetland areas. This opportunity will thereby enhance essential war-fighting skills. The goals of Army training are to produce a force trained to mobilize, deploy, fight, and win anywhere in the world. Army training conditions must match or closely resemble all possible environments throughout the world, including Arctic and Subarctic conditions. Training in wetlands during all seasons would enable the Army to meet its training goals.

The military has used the proposed permit lands for approximately 50 years. Current use includes military maneuvering, training, equipment development and testing, and other defense-related purposes.

The primary military mission of USARAK after the Cold War has been peacetime deployment to support U.S. interests worldwide, the defense of Alaska, and coordination of Army National Guard and Reserve activities in the state. Most USARAK combat forces, the 172nd Stryker Brigade Combat Team (SBCT), are at Fort Wainwright, with Fort Richardson as the primary support base.

In order for USARAK to fulfill its military mission, training conditions must include all environments of Fort Wainwright and Donnelly Training Area. Ultimately, military operations are affected by the environment under which they are conducted. The effect of the Arctic and Subarctic environment on materiel and personnel must be understood for survival. Battlefield conditions must be reflected in military training to adequately prepare units for combat. Military units need as much space to fire and maneuver in training as they would in combat. The need for training in wetlands and other Subarctic conditions is essential for survival in battle.

Fort Wainwright, Donnelly Training Area and Fort Richardson have been withdrawn from public use for military purposes for the past 50 years. An unavoidable and necessary part of training Soldiers to survive and win in battle is the disturbance of vegetation and soil. The U.S. Army is dedicated to providing this training opportunity. Furthermore, the Army is committed to responsible use of its training lands to provide continued training opportunities for many generations of Soldiers.

Natural resource management considerations and safety demands associated with the training mission limit other potentially more damaging land uses. Damage from training activities will be repaired under the Land Rehabilitation and Maintenance component of the Integrated Training Area Management program.

The following sections list the general and specific conditions that are part of the 2000-2005 wetland permit. Some of these conditions may change with the renewed permit. The Wetland Monitoring Protocol is an important responsibility of the Integrated Training Area Management and/or Range and Training Land Assessment coordinator at each post.

### *SD3.1.2.2 General Conditions:*

1. You must maintain the activity authorized by this permit in good condition and in conformance with the terms and conditions of this permit. You are not relieved of this requirement if you abandon the permitted activity, although you may make a good faith transfer to a third party in compliance with General Condition 3 below. Should you wish to cease to maintain the authorized activity or should you

desire to abandon it without a good faith transfer, you must obtain a modification of this permit from this office, which may require restoration of the area.

2. If you discover any previously unknown historic or archeological remains while accomplishing the activity authorized by this permit, you must immediately notify the U.S. Army Corps of Engineers Regulatory Branch Office of what you have found. We will initiate the federal and state coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

3. If you sell the property associated with this permit, you must obtain the signature of the new owner in the space provided and forward a copy of the permit to this office to validate the transfer of this authorization.

4. If a conditioned water quality certification has been issued for your project, you must comply with the conditions specified in the certification as special conditions to this permit. For your convenience, a copy of the certification is attached if it contains such conditions.

5. You must allow representatives from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit.

#### *SD3.1.2.3 Special Conditions:*

1. Prior to field exercises, as a part of planning, information provided on the environmental overlay maps shall be ground-truthed against actual conditions to avoid and minimize potential impacts to wetlands and species of concern, particularly during times of seasonal transition.

2. Prior to field exercises, as a part of planning, the 50 meter "significant restrictions" buffer shall be clearly marked on the ground and communicated to troops. Reclamation measures of the buffer zone shall include removal of any flagging or marking material.

3. Only the minimum footprint necessary shall be used for training activities. Wetlands adjacent to military operations not necessary for training will not be encroached upon, thus minimizing additional disturbance.

4. For operations on established roads passing through wetland areas, natural drainage patterns shall be maintained by culverts. Culverts shall be maintained to ensure that they are not crushed or blocked, to avoid undue flooding, and to ensure proper passage of fish and other aquatic organisms.

5. In any location, on existing roads, trails or reclaimed areas, etc. preventative measures shall be taken to minimize erosion and the need for subsequent additional reclamation measures, including but not limited to temporary closure of roads during break-up or freeze down, installation of water bars to minimize gully erosion and sediment transport, use of insulation material to prevent thawing, use of applied or modified bioengineering techniques such as willow breaks, and prohibition of driving vehicles straight up hillsides.

6. Foot traffic only shall be permitted within the 50 meter buffer, except at designated ice bridge access routes. Other training activities, such as bivouacking and off-road maneuver are prohibited within the 50 meter buffer and the ice bridge access corridor.

7. During field exercises, for operations occurring on existing roads or rights-of-way or other designated routes, vehicles shall remain on the existing path except when otherwise directed. All vehicles shall be

restricted to established roads and dry trails during break-up (usually 1 April through 15 May). The purpose of this condition is to minimize incidental damages to wetlands.

8. During field exercises, for operations occurring off-road or on winter trails, areas shall not be used to the point where more than 10% incidental clearing of the vegetative mat occurs. If incidental clearing of the vegetative mat exceeds 10%, affected trails (or areas) shall be rotated out of use until sufficient recovery occurs such that the area would again support training.

9. During field exercises where excavation is required, the organic layer must be removed and stockpiled so it can be reused for reclamation purposes. All overhead cover, such as logs and other woody debris, shall also be stockpiled.

10. During field exercises in summer months, tracked or wheeled maneuver shall not be permitted within 50 meters of all streams, lakes and any open flowing water, unless a stream crossing has been previously authorized by Alaska Department of Natural Resources, Office of Habitat Management, and occurs at a 90-degree angle to the stream. The purpose of this condition is to avoid and minimize discharge of sediment into open waters and degradation of streambanks and streambeds.

11. Fish spawning streams, as designated by Alaska Department of Natural Resources, Office of Habitat Management, shall not be crossed during summer months. The purpose of this condition is to avoid and minimize discharge of sediment into open waters and degradation of streambanks and streambeds.

12. Stream crossings by vehicles are allowed in winter months (usually October through March) at designated ice bridge sites and other areas that have been permitted by Alaska Department of Natural Resources, Office of Habitat Management, if there is no flowing water. The purpose of this condition is to avoid destruction of overwintering habitat.

13. Use of winter trails is limited to winter months when snow cover and frost depth are sufficient to protect the underlying vegetation, soil, and permafrost from undue disturbance. Undue disturbance is considered to be a greater than 10% damage to the vegetative mat, causing exposure of underlying mineral soil. If snow or freeze conditions are reasonably anticipated to be insufficient to prevent the 10% damage, such as might occur during low snow years, during maneuver in hummock areas, or under other adverse conditions, the training activity shall be rescheduled to a different area where impacts would be less.

14. When plowing trails, bivouac sites or other training areas in winter months, the snowplow blade must be kept elevated sufficiently to avoid damaging the vegetative mat or soil beneath the snow pack. Snow cover must be sufficient to allow at least 6" of snow pack on an area. No more than 10% damage to the underlying vegetative mat on a training site may occur, to avoid exposure of underlying mineral soil. Plow debris must not be left on top of any lakes or streams. Disruption of large areas of the vegetative mat or woody vegetation is not allowed.

15. After training activities, the Army shall reclaim all disturbed wetland areas associated with training activities. Training sites shall be reclaimed so that the condition of the training sites duplicates as far as practicable the condition of the sites prior to disturbance. At a minimum, foxholes, trench systems, tank traps, hull down positions and explosive excavations must be refilled and leveled, and any portion of the vegetative mat that has been disturbed and stockpiled shall be redistributed as evenly as possible over the surface of the ground. All overhead cover, such as logs, will be disassembled and scattered. The goal is to have no more than 10% disturbance of the rooty shrub mat with subsequent exposure of underlying soils. Additionally, any streambanks or other slopes that have been inadvertently disturbed shall be restored to a stable condition to an angle of repose where they are not eroding, are not encouraging additional erosion,

and where revegetation can occur. Reclamation may include but is not limited to a range of suitable measures such as breaking up large rooty clumps into smaller ones, re- distribution of smaller clumps over the disturbed areas, use of geotextiles, bioengineering, seeding or other techniques.

16. Seeding shall be used as a reclamation measure when vegetation has not re-established within a reasonable length of time as determined by agreement between resource management and Corps personnel, or when specifically required for an appropriate erosion control measure. Species to be used for reseeding and planting should be native to the site. If these species are unavailable, then species native to the area or state of Alaska should be used. The use of non-native species should be used only when the use of native species is not available.

17. Restoration work must be accomplished prior to thaw conditions of the following summer season.

18. A summary report of annual wetland impacts from training activities shall be provided to the Corps of Engineers regulatory office no later than August 31 of the summer season following training activities. The report shall generally follow the protocol outlined in the attached "Wetlands Monitoring Protocol" provided by the Army. An annual site inspection shall occur, as arranged between resource management and the Corps. The inspection and annual report shall reflect activities undertaken each year with special attention paid to trouble spots and non-compliance issues. Also, there shall be allowances to evaluate and monitor conditions for effectiveness, with the ability to delete, modify or add new conditions as needed.

19. This permit does not authorize ice bridges, construction of permanent facilities (such as roads, buildings, pads, bank stabilization structures, dams, levees, or dikes), weapons firing into impact areas, unexploded ordnance, recreational activities or other activities addressed by state or federal permits, licenses, entitlements, or environmental assessments (Environmental Assessment). These activities would be addressed under separate wetland permit requests.

### SD3.1.3 Fire Danger Rating System

The fire danger rating system is outlined in USARAK Range Regulation 350-2. The system follows the Canadian Forest Fire Danger Rating System and utilizes the Fire Weather Index. The fire weather index is calculated and translated into low, moderate, high or extreme by the various post fire departments. Each level on the scale corresponds to training restrictions. G3 Range Control is responsible for conveying and implementing the Fire Danger Rating System to the Soldiers. Fire weather index calculations are based on weather observations from remote automated weather stations established in all of the major training areas. The fire weather index is calculated May through September. Waivers for training restrictions established by the fire weather index are granted by G3 Range Control after consulting with the USAG-AK Fire Chief and the Bureau of Land Management, Alaska Fire Service Military Zone Fire Management Officer.

### SD3.1.4 Range Facility Management Support System

Range Facility Management Support System is a multi-user, PC-based software package that automates the real property inventory, scheduling, firing (operations) desk, and management functions at an installation Range Control Center. Range Facility Management Support System was developed to optimize the scheduling, use, and operations and maintenance functions for an installation's live-fire ranges, maneuver training areas, and other related training facilities and assets under AR 210-21, *Army Ranges and Training Land Program*.

The basic modules of Range Facility Management Support System are scheduling and fire desk operations. In addition to the basic tabular database management functions that are automated in Range

Facility Management Support System, several modules have been added to increase data collection, storage, and analytical capabilities. A brief description of two of the modules that affect natural resources management follows:

*Automated Surface Danger Zone* application digitizes the range firing fans and surface safety fans for all of the Army's current and projected direct fire, indirect fire, and aerial delivery systems. These surface danger zones are contained in AR 385-63, *Army Range Safety Program*. Automated surface danger zones allow Range Control managers to better serve users in the planning and conduct of complicated combined arms live-fire and non live-fire training events.

*Training Facility Inventory/Utilization* application is currently under development and will allow Range Control managers to quantify facility usage data (electronically or manually) and perform the mathematical functions to determine the utilization trends for each range facility or training area. This application will also interface with the Training Requirements Integration application of Integrated Training Area Management for effective and efficient land management planning consistent with current and future environmental prevention considerations.

Range, Target, and Standards in Training Commission Application automates the frequency of direct fire and indirect fire lane or firing points training requirements for specific Modified Table of Organization & Equipment and Table of Distribution & Allowances units and activities. Among other things, Range, Target, and Standards in Training Commission Application captures amounts and types of munitions fired at each range. This data is required for Emergency Planning and Community Right to Know Act reporting, an environmental reporting requirement.

## SD3.2 USAG-AK Conservation Regulation 200-3

USAG-AK Regulation 200-3 is a composite regulation providing for the enforcement of outdoor recreation on U.S. Army Garrison Alaska lands and procedures for gaining access. The regulation further provides for the use and treatment of forest resources, treatment of cultural resources, harvest of fish and game resources in compliance with state (Alaska) and federal laws, possession and use of firearms (AR 190-1), and the use of off-road recreational vehicles. Specific policies, procedures and assigned responsibilities for the management and administration of the natural and cultural resources are also located in this document.

These provisions apply to all personnel, military and civilian, whose activities involve or affect the use or protection of natural and cultural resources on USAG-AK lands. The Conservation Branch of the Directorate of Public Works is the proponent agency. A review process is provided for and is conducted on an annual basis to insure compliance with changing mandates, management practices, and to minimize conflict with the Army mission.

USAG-AK Regulation 200-3 finds its origin and mandate in the Sikes Act (16 U.S.C 670), Army Regulation 200-3 (Natural Resources – *Lands, Forest, and Wildlife Management*), and the various Integrated Natural Resources Management Plans for Alaska.

## SD3.3 USAG-AK Hunting Supplement to Alaska Department of Fish and Game Hunting Regulations

The USAG-AK 200-3 Supplement is a user-friendly version of the USAG-AK 200-3 regulation intended for use by the recreational user of Army lands and its natural and cultural resources. Each installation (Fort Richardson, Fort Wainwright to include Donnelly Training Area) has it own supplement. These documents address such topics as the procedure for accessing military land to prevent conflict with military training; permits and licenses; off-limit areas; hunting, fishing and trapping; seasons and bag limits specific to the installation; possession and use of firearms; off-road recreational vehicles; and includes maps of the installations. The supplement is available at all installation visitor centers, Conservation Branch offices, and from (MP) Conservation Officers. The documents are reviewed and published annually by the Conservation Branch.

Points of contact are the Natural Resources technicians at each post.

Supplements for Fort Wainwright, including Donnelly Training Area, and Fort Richardson, must be updated on a regular basis as rules and regulations change. Updates can be timed prior to large printings (annually or even biennially depending on need).

Supplements must include information specific to conducting recreational activities on USAG-AK lands, including the following:

1. Phone numbers where more recreational information can be obtained.
2. Information on the Recreation Access Permit.
3. Rules and regulations for access to USAG-AK lands.
4. A description of off-limit areas.
5. State residency rules, including a description of active duty military residency rules.
6. Hunting information to include special Army hunts and different Army rules for various species (such as black bear baiting registration requirements).
7. Trapping.
8. Fishing, to include a list of stocked lakes.
9. Off-road recreational vehicle rules.
10. Maps that include off-limit areas, stocked lakes, and special management units.

Supplements do not need to include general information that can be found in the state hunting, trapping or fishing regulation booklets. Exceptions to this are military-specific information such as the active duty military residency rules.

Once the current supply of supplements runs low, updates will be made and a new version will be printed. 2,000 to 3,000 copies for the Fort Wainwright version seem to be adequate for about one year. These supplements can be handed out when individuals receive their Recreation Access Permit card and at public outreach events.

# SD4 Policy

There are a number of installation policies that affect the use and management of natural resources on USAG-AK lands. The installation access policy, land use policy, timber policy, recreational use policy, and data release policy are described below.

## SD4.1 Installation Access Policy

### SD4.1.1 General

Civilians and military personnel requesting recreational access to USAG-AK's lands and waters must obtain a Recreation Access Permit. This permit provides conditional authorization to enter Army training lands and is good for two calendar years. Permits can be obtained at each installations's Visitor Center or

Natural Resources Office. On Donnelly Training Area, permits can also be obtained by calling the Environmental Office, 873-1614. The requestor must provide the following information:

(1) Full name
(2) Physical Address (place of residence)
(3) Phone Number
(4) Photo Identification

After the Recreation Access Permit permit is obtained and prior to entering USAG-AK lands, all recreational users must log in, using the unique identifier located on the Recreation Access Permit, to the U.S. Army Recreational Tracking System (USARTRAK) to ascertain which training areas are available for recreational use. Individuals are prohibited from entering areas other than those indicated as open on the USARTRAK system. Individuals are also prohibited from entering any of the areas indicated as closed by placard, blockade, verbal warning, red flag or other means of communication. Authorization for access is subject to change based on the current Force Protection Condition levels and mission training requirements.

### SD4.1.2 Fort Richardson

All recreational users south of the Glenn Highway must use USARTRAK to log in and to ascertain which training areas are available for recreational use. In addition to logging in to USARTRAK, all recreational users requesting access to Fort Richardson north of the Glenn Highway and who do not possess an authorized Department of Defense Identification card/ Fort Richardson installation pass or are not on the Fort Richardson Installation Access Roster (See Fort Richardson Garrison Commander Policy #25-15 and #24-16) must go to the Fort Richardson Visitor's Center at the main gate to obtain a visitor's pass. Recreational visitors to Fort Richardson may check in to a maximum of two training areas listed as opened to recreation on the USARTRAK system. All recreational visitors on Fort Richardson must log out of the training areas by using the USARTRAK system by 2400 hours on the day of use.

### SD4.1.3 Fort Wainwright

All recreational users on Yukon Training Area, Tanana Flats Training Area, Donnelly Training Area and Gerstle River Training Area must use USARTRAK to log in and to ascertain which training areas are available for recreational use. In addition to logging in to USARTRAK, all recreational users requesting access to Fort Wainwright Main Post and who do not possess an authorized DOD Identification card/ Fort Wainwright installation pass holder or who are not on the Fort Wainwright Installation Access Roster must visit the Fort Wainwright Visitor's Center at the main gate to obtain a visitor's pass. Recreational users requesting access to training areas (Tanana Flats Training Area, Yukon Training Area, Donnelly Training Area, Gerstle River Training Area) who do not travel through Main Post, need not obtain a visitor's pass prior to entry of the training areas. Recreational users, after properly logging in to USARTRAK, may enter any open training areas using approved motorized and non-motorized modes of conveyance in strict compliance with all pertinent state, federal and USAG-AK rules and regulations.

Hunting, trapping, and fishing programs on Donnelly Training Area will remain open to the military's personnel, dependents, civilian employees, as well as members of the public who have a current Alaska hunting, trapping, or fishing license. These individuals need only obtain a USAG-AK Recreation Access permit. There are no current restrictions on the number of permits issued to the public.

Hunter access is a significant issue with regard to the impact areas on Donnelly Training Area. These areas are closed to access due to unexploded ordnance and the related safety and liability concerns (AR 385-63). This includes the Oklahoma and Mississippi impact areas. However, there is often illegal access during hunting, fishing, all terrain vehicles and boating activities.

- The public is expected to comply with all rules concerning restricted access along with permanently and temporarily closed portions of the post.
- The public may use unimproved remote landing areas after complying with notification requirements, provided this use does not interfere with military activities or incur federal liabilities.
- Signs will be posted to warn the public of impact area and other closed areas.

Warning/information signs are posted on flagpoles at all significant access points along the Richardson Highway. When an area is in use, a red flag is raised at the access point, warning the public of current off-limit areas.

### SD4.1.5 USARTRAK

U.S. Army Garrison Alaska has established the U.S. Army Recreation Tracking (USARTRAK) system to facilitate recreational access onto military lands. All persons (civilian and military) desiring to recreate on Army lands in Alaska must obtain a Recreational Access Permit and must use the USARTRAK system (per USAG-AK access policy effective 15 November 2004). USARTRAK is an automated access system that allows registered users (Recreation Access Permit holders) to telephonically access range opening data and to check in to areas open to recreation.

#### *SD4.1.5.1 USARTRAK Objectives*

The main objectives of USARTRAK are to:

- Increase public safety
- Reduce disturbance to military training
- Gather land use data for land management decisions

#### *SD4.1.5.2 Background*

The Sikes Act, as amended in November 1997, requires that every installation have an Integrated Natural Resources Management Plan and that each Integrated Natural Resources Management Plan must provide for public access to the military installation that is necessary or appropriate for sustainable use of natural resources by the public to the extent that such use is consistent with the military mission and the needs of fish and wildlife resources, subject to requirements necessary to ensure safety and military security.

In order to provide for and report on these requirements, a simple but reliable system of tracking recreational use by days and type of activity has been designed. The old access system involved getting an hunting, trapping and fishing permit from the post, usually the Military Police, the Morale, Welfare and Recreation office, or the Natural Resources office. This type of permit only allowed for the reporting of numbers of permits issued to users, but not total numbers of user days and type of activities. A call-in system was developed, but it did not meet the full intent of the program. The new system for access to military lands for recreational activities is designed to streamline both the reporting process for USAG-AK and the check-in process for the user.

USAG-AK no longer issues hunting, trapping and fishing permits. Instead, recreational users, including firewood cutters, will be issued a Recreational Access Permit. Current hunting, trapping, and fishing holders will not have to acquire a Recreation Access Permit. The new Recreation Access Permit permits will continue to be valid for all types of recreational access.

As always, recreational activities are permitted in the training areas as long as there are no conflicts with the military mission or training activities. This is for public safety, the safety of the troops, and to maintain the integrity of the military training experience.

### *SD4.1.5.3 Recreation Access Permit*

- Obtain a Recreational Access Permit at the main gate 24 hrs.
- Good for two years from the date of issue.
- Good for recreational access USAG-AK wide (brochures explaining use of USARTRAK for Fort Wainwright/Donnelly Training Area and Fort Richardson are provided at time of Recreation Access Permit registration. Note, if you register on Fort Richardson, you will only be given information for Fort Richardson unless you specifically request brochures for Fort Wainwright/Donnelly Training Area as well).
- Must be carried on person.
- Free.
- Renew Recreation Access Permit every two years.

### *SD4.1.5.4 Steps involved in using USARTRAK*:

When you call the USARTRAK phone line you will be given a series of prompts that will allow you to select the area you want, activity you will be engaged in, and provide you with information about training area closures.

Your post recreation access permit number and one of the local phone numbers is all you need to access this phone system.

The Fairbanks area number is 353-3181.
The Delta Junction number is 873-3181.
The Anchorage area number is 384-3181.

When you call the USARTRAK phone line you will be prompted through the system as follows:

- First you will hear the welcome message.
- You will be asked to enter your Recreation Access Permit number.
- Select the post you wish to enter (press 1, 2, or 3 for Fort Richardson, Fort Wainwright, or Donnelly Training Area).
- Select the activity from the list that most closely identifies the activity you will be engaged in that day. You will then hear the closures for that post for the week.
- You will be asked if you are cutting firewood or Christmas trees. If you select yes, you will be at the end of the check-in system.
- If you are not cutting firewood, you will next be asked to select which specific area you will be entering on that post. You will then be asked which major area of the installation you want to enter. For example, at Fort Wainwright, do you want to enter the Tanana Flats Training Area, the Yukon Training Area or the Fort Wainwright Main Post? The menu will prompt you for the number that corresponds to the area of choice. If you selected Fort Richardson in a previous menu, you will be asked to select two areas of choice.
- Each large training area of an installation is divided into smaller segments; for example, within the Tanana Flats Training Area there is the Wood River corridor, the Tanana River corridor, The Salchaket/Clear Creek corridor, Blair Lakes Area, Clear Creek Landing Strip or other.
- You will be asked to enter the number of consecutive days you will be in that location.
- You are now at the end of the menu and you are checked in to the system.

The USARTRAK phone system allows you to check into the installation and training area of your choice from home or your cell phone. You may check in up to 24 hours in advance. You may also check in from any location. For example, if you are in Fairbanks on Monday you may check into a training area at

Donnelly Training Area for Tuesday using the local phone number. You do not have to use the Donnelly Training Area number to check into Donnelly Training Area. Remember multiple permit numbers can be entered at the beginning for groups, and there is no check-out requirement, except at Fort Richardson.

## SD4.2 Land Use Policy

Encroachment may be defined as legal activities and land use on or next to a military installation that are incompatible with long-term military mission sustainability and success. Building residences and subdivisions right alongside an installation boundary often results in conflicts with the public due to noise and dust. USAG-AK is committed to working with surrounding landowners to minimize these types of potential conflicts.

Over the last ten years, USAG-AK has been inundated with numerous requests and proposals from state, federal, and municipal government agencies, businesses, utilities, clubs, organizations, and individuals for authorization or permission to use Army lands on a long-term basis for nonmilitary purposes. Requests often have included commercial or long-term real estate interests involving rights-of-way, easements, land use permits, leases, outgrants, land transfers, exclusive use areas, and special concessions. This has been especially evident on Fort Richardson where some of the more notable of these include:

- A public snowmachine trail and corridor through Fort Richardson connecting Anchorage and Eagle River along the Glenn Highway.
- A new right-of-way for the Alaska Railroad through Fort Richardson from Anchorage to Birchwood.
- A real estate action to allow the Municipality of Anchorage to develop Clunie Lake on Fort Richardson into a float plane base.
- Transfer of approximately 30 acres of Fort Richardson land to the Anchorage School District for a middle school.
- Allow Bartlett High School to establish an official cross-country ski trail on Fort Richardson lands.
- Conduct commercial rafting operations on the Eagle River portion of Fort Richardson.
- Development of a destination resort, RV camping areas, horseback riding trails, Off-road recreational vehicle areas, and associated recreational activities in Fort Richardson's Arctic Valley.
- Use of Fort Richardson's protected waterfowl nesting areas for dog training by the Alaska Retriever Club.
- Siting of a Chugach Electric generation plant on Fort Richardson.
- Use of Fort Richardson lands by Ford Motor Company to test and advertise its vehicles.
- Use of Fort Richardson lands for establishment of an oyster farm adjacent to Eagle River.
- 300 acres of Fort Richardson training lands transferred to the Municipality of Anchorage for a landfill.
- 65 acres of Fort Richardson lands transferred to Cook Inlet Region, Inc.
- 65 acres of Fort Richardson lands transferred to Elmendorf Air Force Base for new hospital site.
- Port of Anchorage city bypass through Fort Richardson.

Present-day Fort Richardson, at roughly 61,000 acres, is a fraction of its original size (161,000 acres). The loss of all these training lands over the years, coupled with the fact that urban development now surrounds much of the installation has and continues to force this Command to greatly limit and constrain much of its training activities. Despite this, Fort Richardson still offers our combat Soldiers a valuable opportunity to train in a remarkable and varied environment. Its rugged beauty is also a key factor in enhancing our Soldiers' and their families' quality of life. Unique in both its natural resources and its geographic location next to Alaska's largest city, Fort Richardson rises from sea level to over 5,300 feet within a distance of only 12 miles. Contained within its borders are all the ecosystems from maritime to alpine, and the diversity of plant and animal life that occur there.

As the populations of Anchorage and its satellite communities continue to grow and develop, it is anticipated that attempts to obtain or use portions of Fort Richardson for nonmilitary purposes will persist and probably increase. The term “military purpose” with regard to land use means programs, activities, and facilities necessary to accomplish the military mission and those support elements crucial to its implementation. Any additional long-term nonmilitary uses will create the potential for adverse impact on training and thereby threaten Fort Richardson's viability as a military installation. Besides the mission, USAG-AK is mandated by both law and common sense, through sound stewardship, to preserve the integrity and health of the environment. Only by doing this can the military be assured of maintaining the realistic backdrops and scenarios crucial to its training.

It is therefore the position of USAG-AK to generally deny requests for nonmilitary uses of Fort Richardson properties if those requests include or involve a requirement for long-term real estate commitments, such as leases, easements, or land transfers, or if they create a potential adverse impact on the military mission or the environment. The only exceptions to this will be when such actions clearly result in tangible benefits to the military training mission or to the environment. These situations will be carefully scrutinized and evaluated by appropriate staff. No longer is “good public relations” alone a justifiable reason to sacrifice limited and crucial training lands. It also is the position of USAG-AK to adopt a policy which favors temporary, non-commercial low impact uses of Fort Richardson by the local community, consistent with training and the military mission, as long as Fort Richardson natural resources will not be impacted adversely. Examples of some of these activities now in effect are:

- Use of the small arms ranges by the Alaska Rifle Club, Alaska State Troopers, Anchorage Police Department, Alaska State Park Rangers.
- Dog mushers, snowmachiners, and ATV riders in specified areas.
- Cross-country skiing.
- Firewood cutting.
- Iditarod sled dog race.
- Alaska Retriever Club dog trials.
- Special Olympics.
- Boating and rafting.
- Hunting and fishing.
- Boy Scouts, Girl Scouts, and Cub Scouts.
- Youth programs such as Campfire.
- Iron Dog Snowmachine Race.
- Wildlife Museum, open to the public.
- Use of Otter Lake and Cottonwood Park by the public.
- Youth Corps and High School JROTC training.

This Integrated Natural Resources Management Plan will serve as the Command's guideline and directive for administering and managing natural resources on Fort Richardson lands and waters. It is implemented by both the USAG-AK Conservation and Integrated Training Area Management programs, primarily through the Public Works Environmental Resources Division and the Directorate of Plans, Training, Security and Mobilization. It will be consulted and used for every decision and action that affects or has a potential to impact Fort Richardson's lands, waters, and other natural resources.

## SD4.3 Timber Policy

Army Regulation 200-3, *Natural Resources - Land, Forest, and Wildlife Management* (28 February 1995), Chapter 5, Forest Management, Section 5-2, Timber Management, b. Harvesting actions, (2) Disposal action, (d) states,

"Commercial forest products will not be given away, abandoned, carelessly destroyed, used to offset costs of contracts, or traded for products, supplies, or services. All forest products are to be accounted for and commercial harvests completed prior to the start of any construction that may impact forest resources. When forest products are removed from Army lands by any means other than a commercial timber sale, a dollar amount equal to the fair market value is to be deposited to Budget Clearing Account 21F3875.3960 20-C S99999 for products removed."

USAG-AK policy on forest products use, as stated in the USAG-AK Integrated Natural Resources Management Plan 07-11, is as follows. Timber utilization procedures depend on vegetation rights management authority. The first step in this process is to determine management authority of the vegetation rights. The Environmental Resources Department should be contacted with a map of the proposed area to be cleared. The Environmental Resources Department will consult Geographic Information System overlays depicting vegetation rights management authority. Three vegetation rights land management authority categories exist on USAG-AK lands: withdrawn lands for military use from public domain where vegetation rights are managed by the Bureau of Land Management (BLM), withdrawn lands for military use from public domain where vegetation rights are managed by USAG-AK, and fee simple lands purchased by the Army where vegetation rights are managed by USAG-AK. Under applicable withdrawal legislation for the Tanana Flats Training Area, Yukon Training Area, Donnelly Training Area East and West, and Public Land Orders 2622 and 2676, the United States Department of the Interior, BLM retains vegetation rights. Any vegetation manipulation by USAG-AK is done in cooperation with BLM. BLM and USAG-AK timber management practices and contract stipulations govern timber sales from these lands. The withdrawals for the Main Post training areas of Fort Wainwright and Fort Greely, Dyke Army Range, Charlie and Bravo Batteries, Gerstle River Test Site, Whistler Creek Rock Climbing Area, homestead sites purchased fee simple, and lands withdrawn under Public Land Orders 2768, 3922, 1153, 1503, and 4161 (Fort Richardson PLO) do not indicate any vegetative management responsibilities for BLM and therefore any sale of timber would be processed through the Army's forest management system. On lands the Army has vegetation rights, any sale of timber would be processed through the Army's forest management system. Future timber harvest activities would be for military mission support and harvest levels are not expected to dramatically increase from past levels.

After vegetation rights management authority has been determined, the next step is timber value determination. Environmental Resources Department forestry staff will conduct a site visit and possible timber cruise to determine species composition, size class distribution, and volume. In general, if the site contains birch, spruce, or aspen over 4 inches in diameter at breast height, the timber has value. If the vegetation rights management authority belongs to BLM, Environmental Resources Department forestry staff will consult the designated BLM forestry representative. The BLM forestry representative and Environmental Resources Department forestry staff will agree upon value of the timber and determine utilization procedures. BLM policy is to always utilize timber. If the timber being removed is of significant value and a commercial operator is interested in purchasing the material, a timber sale will be conducted. If more than one commercial operator expresses interest in purchasing the timber, BLM will advertise the sale, accept bids to purchase the timber, and award the timber sale to the highest bidder. If only one operator expresses interest in purchasing the timber, BLM will sell the timber at salvage value. If no commercial operator expresses interest in purchasing the timber, BLM requires the usable timber to be stockpiled in a location where the public has access to it. This timber will then be disposed of through the firewood program. All people collecting the firewood are required to obtain BLM and USAG-AK firewood and Recreational Access Permits. If the vegetation rights management authority belongs to

USAG-AK, Environmental Resources Department forestry staff will determine value of the timber and determine utilization procedures. Army policy requires utilization of timber (AR200-3). If the timber being removed is of significant value and a commercial operator is interested in purchasing the material, a timber sale will be conducted. Timber sales conducted by USAG-AK follow procedures outlined in the Army's Timber Sale Policy Guidance (2002). If more than one commercial operator expresses interest in purchasing the timber, USAG-AK will advertise the sale, accept bids to purchase the timber, and award the timber sale to the highest bidder. If only one operator expresses interest in purchasing the timber, USAG-AK will sell the timber at base value set by the State of Alaska Division of Forestry. If no commercial operator expresses interest in purchasing the timber, the usable material will be stockpiled in a location where the public has access to it. This timber will be disposed of through the firewood program. All people collecting the firewood are required to obtain USAG-AK firewood and Recreational Access Permits.

Areas to be cleared should be brought to the attention of the Environmental Resources Department as soon as possible. Timber sales can take up to one year from the advertising process to the final removal of the timber. If timber sale operators are not interested in working the site to be cleared, the area can be opened to firewood cutters. Firewood cutters generally will not remove all usable material from a site, but the longer they have to work a site the more material will be removed. Opening sites early to timber sale operators and firewood cutters can be used to clear the land and reduce the cost of construction. If adequate time is not available to conduct a timber sale or allow for firewood cutters to work a site, the usable timber should be stockpiled in an area where timber sale contractors or the public have access to the material.

Additional stipulations for timber sales and firewood cutting areas include the following procedures. All forest harvesting actions must be coordinated with the Environmental Resources Department forestry staff prior to action. Public use of forest products requires a permit from the Environmental Resources Department forestry staff prior to removal of timber from the installation. Mechanical clearing techniques must be coordinated with the Environmental Resources Department forestry staff prior to action. Hand clearing techniques should be used to preclude erosion or when conducting harvesting activities in wetlands, when possible. Timber harvest activity is not allowed within 50 feet immediately adjacent to an anadromous stream or high value resident fish water body. Within the next 50 feet, a 50% minimum retention of trees must occur. Permits are required for the vehicular crossing of anadromous and resident fish streams. Trees with a diameter-breast-height of less than 4 inches may be cut without prior approval. Trees with a diameter at breast height of less than 4 inches; slash; and other debris may be distributed into adjacent upland areas, piled for burning, hauled away, or chipped and distributed into adjacent upland areas. Specific disposal methods will be determined by the Environmental Resources Department forestry staff prior to action. If spruce logs are not immediately removed from the site, the following special precaution must be taken. All spruce logs greater than 4 inch diameter at breast height must be scored the length of the log with a chainsaw to a ½ depth so as to cause drying of the phloem to prevent bark and ips beetle infestations in nearby healthy trees. Trees with a diameter at breast height of more than 4 inches should be salvaged for public use up to a 4 inch top. Trees with a diameter at breast height of more than 4 inches should be stacked separately from smaller diameter trees. All stumps should be cut within 6 inches or less of the ground surface. Spruce boughs are only to be collected from trees sized less than 4 inches diameter at breast height for troop training. All large-scale harvest activities must be coordinated with the Environmental Resources Department forestry staff to ensure other miscellaneous harvest requirements are met prior to action.

## SD4.4 Off-Road Recreational Vehicle Policy

Off-road recreational vehicles are used in association with many activities in the Alaskan Interior. All-terrain vehicles which are three or four wheel recreation vehicles, snowmachines, dirt bikes, four-wheel-drive trucks, swamp buggies, and civilian use small unit support vehicles are all considered off-road recreational vehicles. These vehicles are used to access hunting, fishing, and trapping areas, for recreational riding and for other activities.

### SD4.4.1 Objectives

Manage off-road recreational vehicle use on USAG-AK lands consistent with protection of natural resources, the needs of the military mission, and the provision of high quality outdoor recreation opportunities.

### SD4.4.2 Definitions

Off-road recreational vehicles include snowmachines, dirt bikes, three and four-wheelers, and four-wheel-drive vehicles. Off-road recreational vehicles are used in association with many activities in the Alaskan Interior. All-terrain vehicles, snowmachines, dirt bikes, four-wheel-drive trucks and airboats are all considered off-road recreational vehicles.

Motorized watercraft include all boats with some type of motor attached, which also includes jetboats, riverboats, and airboats. These vehicles are primarily used to access hunting, fishing, and trapping areas, for recreational riding and for other activities.

### SD4.4.3 Off-Road Recreational Vehicle Management Areas

All land and water areas will be closed to off-road recreational use by motorized off-road recreational vehicles except those areas and trails that are determined suitable and specifically designated for such under the procedures established in this Integrated Natural Resources Management Plan. In determining suitability of areas and trails for off-road recreational vehicle use, each type of motorized off-road recreational vehicle will be considered separately, taking into account its potential environmental impact, the seasonal nature of its use and opportunities for counter-seasonal use with other recreational uses.

USAG-AK is managed for a number of different types of public recreational use. All areas that are determined open for recreational use may be closed temporarily during periods of military use. All users must daily check in through USARTRAK to determine if areas are open to recreational use. USAG-AK uses the following classification system to describe recreation areas on the installation.

> ***Open Use Area*:** Open to all types of off-road recreational vehicles. Open to all other recreational activities year-round.
>
> > *Frozen* (6+ inches of snowcover): No restrictions for any off-road recreational vehicles when soil is frozen.
> >
> > *Unfrozen summer conditions:* During unfrozen conditions, off-road recreational vehicles over 1,500 lbs (road vehicles, dune buggies, Argos, Small unit support vehicles etc.) must stay on existing roads and trails. No restrictions for off-road recreational vehicles under 1,500 lbs (ATVs, snowmachines, dirt bikes etc.). Motorized watercraft must stay within existing open water channels.
>
> ***Modified Use Area***: Open to all types of off-road recreational vehicles. No restrictions for any off-road recreational vehicles when soil is frozen. All off-road recreational vehicles must stay on existing roads and trails during the summer. Motorized watercraft must stay within existing open water channels. Open to all other recreational activities year-round.

*__Limited Use Area__*: Open to all non-motorized recreation (hunting, fishing, trapping, hiking, skiing, and berry picking) year-round but are not open to any type of off-road recreational vehicle at any time. Motorized watercraft must stay within existing open water channels.

*__Special Use Management Area__*: An area managed for recreational use under specific rules that apply only to that area (i.e., Tanana Flats Training Area Airboat Special Use Management Area).

*__Closed Area__*: Closed to all recreational activities year-round. Closed areas include but are not limited to airfields, tank farm, landfill, small arms ranges, impact areas, ammunition storage point, etc.

USAG-AK Regulation 200-3 (Appendix D), and the Fort Wainwright, Donnelly Training Area, and Fort Richardson Supplements, address areas open and closed to off-road recreational vehicle use on USAG-AK lands. Use of privately owned off-road recreational vehicles on post is allowed on a limited basis. The Fort Greely Resource Management Plan restricts off-road recreational vehicles along the Trans-Alaska Pipeline System work pad used for maintenance along its line without permission of Alyeska Pipeline Service Company.

# SE OUTREACH

## SE1 Introduction

Outreach includes briefings, presentations, training, educational media, programs and driving tours.

## SE2 Briefings, Presentations, and Training

### SE2.1 Newcomer Briefings

The Newcomer's Orientation is a day-long briefing designed to minimize the disruption associated with transition, advise new arrivals on Command policy, procedures, and force protection issues and offer education on the realities of living in the Arctic. Soldiers and their families are welcomed by the various commanders, and members of the military and civilian community present on a wide array of topics to include but not limited to: voter registration, recreation opportunities, force protection, fire protection, chaplain services, job and volunteer opportunities, Red Cross services, native cultural awareness, and health issues. This is key training to the force protection program and newly deployed Soldiers undergo this training within 20 days of arrival.

Directorate of Public Works Conservation personnel participate in these orientations, addressing subjects such as nuisance wildlife and outdoor recreation. Troops are briefed as to the type of wildlife they may encounter on post and throughout south-central or interior Alaska. Although they are encouraged to enjoy fishing, hunting and general wildlife viewing, it is understood that many of the troops are new to Alaska and do not necessarily understand the dangers of large animals, specifically bear and moose. These dangers are emphasized during the briefing, and recommendations and techniques are given for avoiding these dangers.

### SE2.2 Range Safety Briefing

“The purpose of the monthly range and training area coordination meeting is to enhance unit training. This is accomplished by detecting and eliminating scheduling conflicts and ensuring training needs are met.” (Range Control). The primary objective of the Integrated Training Area Management section of the range conference is for Integrated Training Area Management personnel to discuss, with Army and Air Force Soldiers, different seasonal and current issues from the Integrated Training Area Management, Environmental, and Conservation departments that relates to their training and training needs. Approximately five minutes is allocated for this briefing. Integrated Training Area Management personnel shall develop Power Point presentations for each month of the year and gear it towards its particular season and weather conditions. Each month’s presentations are altered to include new Integrated Training Area Management, environmental, and conservation issues that may have come up during the previous month. Fort Richardson’s and Fort Wainwright monthly training resource scheduling conferences are conducted on the third Monday of each month at 1330.

### SE2.3 Training

USAG-AK military land user education is accomplished primarily through the Sustainable Range Awareness component of the Integrated Training Area Management program. Sustainable Range Awareness gets its message out by creating handbooks, brochures, instructional video’s and Soldier field cards. Sustainable Range Awareness can also be accomplished by regular Soldier briefings, range briefings or environmental training at individual units. Focus on impacts as a result of training and how to mitigate impacts when developing land use education programs for Soldiers.

## SE3 Educational Media

### SE3.1 Environmental Newsletter

Success of the USAG-AK conservation program depends on public involvement. The conservation newsletter is an official USAG-AK publication intended to communicate information to the public about trends, events, and policies related to conservation. The newsletter will also inform the public about meetings and it will remind people about the availability of documents on the USAG-AK conservation website. Submission deadlines for subsequent newsletter articles will be included with each issue, which are typically published two times per year. Submission information will also be published on the USAG-AK conservation website. Articles appearing in the newsletter may be reproduced or shared, unless they are copyrighted.

### SE3.2 Handbooks, Brochures, Field Cards

Sustainable Range Awareness items should be developed when funding is available. Materials should be developed that educate land users on how their activities impact the environment and how to mitigate those impacts. Soldiers should also be motivated to read the materials. Soldiers are inundated with “informational brochures” that often end up being thrown out. Soldiers should get something out of reading these materials such as training value, geographical information, or recreational information. Consider developing items that fulfill a dual purpose of environmental education and training. Instructional videos are another way to educate land users on impacts associated with military training. Videos should describe the training environment in Alaska, discuss common seasonal hazards and identify areas to avoid. Also Sustainable Range Awareness items can be developed that simply advertise the Integrated Training Area Management program. Some Soldiers may not know what Integrated Training Area Management is and how they can benefit from it. Items such as calendars with the

Integrated Training Area Management logo and pictures of training or aesthetic landscapes can make more Soldiers aware of the Integrated Training Area Management program.

### SE3.3 Species Checklists

Purpose – establish protocol for creating and maintaining species checklists.

Points of contact are the Natural Resources technicians and Range and Training Land Assessment Coordinators at each post.

Checklists for use by the public will be generated from these lists. The most popular by far of these types of lists are bird checklists. A bird checklist brochure has been created for Fort Richardson, “Bird Checklist – Anchorage Area Military Reservations.” Bird checklist brochures should also be created for Fort Wainwright and Donnelly Training Area using a standard format. Other lists may be created depending on interest from the public.

## SE4 Programs

### SE4.1 FireWise Program

The FireWise Program was established nationwide to convey information to private home owners on how to protect their property from wildfires. The FireWise Program mainly focuses on the urban/wildland interface, both on Army lands and on adjacent property owners. USAG-AK has adopted the FireWise principles to evaluate and protect range structures and cantonment area buildings. USAG-AK has also implemented the FireWise Program to inform adjacent landowners on how to protect their property from the risk of wildfire. USAG-AK’s FireWise Program strives to reduce wildfire starts on adjacent property which then have the potential of spreading onto to Army lands, damaging valuable training areas. USAG-AK also implements an aggressive hazard fuel reduction program to reduce the threat of wildfires starting on Army lands and spreading to adjacent landowners. Adjacent lands ownership is updated annual by going through state and borough land ownership records. The records are added to a Geographic Information System database with attributes relating to owner, contact information, and structures present. Wildfire fuel hazard assessments for structures are performed to stands set by the FireWise Program (Firewise 2002). All vegetation should be actively managed to reduce fire risk within 30 feet of a structure. Trees should be pruned and spaced at least 10 feet apart out to 100 feet from a structure. Standard assessment forms are used to survey structures. The forms were developed by the Bureau of Land Management, Alaska Fire Service and look at vegetation, building material, location and hazardous material storage. Fuel assessments at a landscape scale look at vegetation flammability, weather, historical fire patterns, fire behavior and proximity to values at risk. Areas with continuous black spruce leading to high value locations receive the highest concern.

### SE4.2 Green Star Program

The following components have been adopted for the USAG-AK Green Star Program, and continuation of these should be encouraged and supported.
1. The Commanding General has charged all U.S. Army personnel, both military and civilian, to actively participate in protection of the environment/environmental stewardship.
2. Green Star issues are discussed in the quarterly Environmental Quality Control Committee meetings.
3. The Pollution Prevention/Waste Minimization Plan is in place and documents are on file in the Environmental Office, and can be reviewed if requested.
4. Training opportunities and participation are given in the following areas

a) Hazardous Communication
b) 8-hour Hazardous Waste Handlers Course
c) 24-hour Hazardous Waste Subject Matter Expert Course
d) 24-hour Hazardous Waste Operations and Emergency Response (HAZWOPER)

5. Information is distributed via the Pollution Prevention Newsletter and the post weekly newspaper, the *Alaska Post*. This paper reaches approximately 8,000 soldiers and family members.
6. USAG-AK is actively involved in meeting environmental standards set by the Army.
7. Paper consumption has been reduced due to the following
   a) Electronic mail or e-mail throughout post to reduce paper flow.
   b) Staff meetings are encouraged to use view multi-media presentations instead of giving out paper.
8. Printers/copiers are energy saving and shut down when not in use after several minutes.
9. Units only order what they need, no more stockpiles of materials.
10. Purchase recycled/reusable material for the office and or unit.
11. Use of ceramic coffee cups, bowls, plates, and silverware, instead of Styrofoam and/or plastic in encouraged.
12. Florescent light tubes have been changed out to a lower wattage and a more pleasant lighting.
13. The Fort Wainwright Environmental Division participates in the Adopt-a-Highway Program.
    a) Consider implementing this at Fort Richardson if an appropriate section of highway becomes available.
14. Recycle aluminum cans.
    a) Consider implementing additional recycling if and when technologies and feasibilities allow. Revisit the issue every five years.

## SE5 Driving Tours

### SE5.1 Viewing Platforms

Purpose – establish protocol for maintaining viewing platforms.

Points of contacts are the Natural Resources technicians at each post.

Viewing platforms have been installed at various locations throughout USAG-AK. These are generally wooden platforms with rails and National Parks-style exhibit bases. Some free-standing exhibit bases have also been installed. Interpretive panels were developed and installed in the exhibit bases.

Develop a comprehensive list of platforms and interpretive panels at each post. Annually inspect platforms for needed repairs and submit appropriate work orders. Inspect interpretive panels for bullet holes of other damage and replace. Develop new interpretive panels to exchange with existing panels and possibly begin an exchange rotation of every three to five years.

### SE5.2 Educational Kiosks

The positioning of 27 educational kiosks on Fort Wainwright, Fort Richardson and Donnelly Training Areas is instrumental to the Army's goals to provide education, awareness and public outreach opportunities to military members and the community. Kiosks, placed in high traffic areas, are universally a sound way to deliver important area specific information. Educational kiosks will be a public platform to deliver a variety of information covering recreational permits, USARTRAK, range closures and safety issues as well as cultural and natural resources information. The kiosks can also solicit survey information relating to a variety of outdoor recreation and natural resource management issues.

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